$2.00 a Year 50c a Copy
Forestry

VETERINARY MEDICINE

MARCH 1940

CONTENTS

FEB 19 1940

"Dogs of War" 136
Leaders and Others 137
Proposed New Practitioners' Organization 138
The Swine Trichinosis Problem 140
Annual Report of the Chief of the B. A. I. 142
C. P. Fitch and R. F. Eagle 147
The Border Between Life and Death 148
When a Veterinary Hospital is a Legal Nuisance 150
A Year of Small Town Meat Inspection 154
Electrometric Device for Detecting Mastitic Milk 158
Insemination of Dairy Cows 164
Dystocia in a Young Heifer 165
Examination of Milk for Streptococci of Mastitis 166
Esophageal Ulceration in a Cow 169
Trichomoniasis in the Utah Experiment Station Herd 170
Practical Experience with Equine Encephalomyelitis 176
Effect of Teniasis on the Condition of Sheep 180
The Time of Ovulation in the Bitch 182
Nutritional Requirements of Dogs 188
Pentastoma Tenioides in Kansas 190
Lymphatic Leucemia in a Hound 190
Inguinal Hernia in a Dog 192
Peafowl 194
Effects of Sodium Amytal and Sodium Barbital 196
Botulism in a Cat 198
Auralgan in Aural Hygiene 198
Abstracts 199-201
The Genesis of Sidebones, 199; Paratyphoid Abortion of Mares, 199; Equine Influenza, 199; Protection of Horses from Poison Gas, 200; Navicular Disease of Horses, 200; Equine Periodic Ophthalmia, 200; The Duration of Pregnancy, 200; Milk Regulations in Portugal, 201; Anthrax in Mink, 201; Deaths Caused by Domestic Animals in Germany, 201.
Book Reviews 202
Osteology, Arthrology and Mylogy of the Horse; Angiology and Splanchnology of the Horse; Horses and Americans.

VOL. XXXV
No. 3

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879.

7632 S. Crandon Ave.
Chicago, U. S. A.

In Canker . . . Otorrhea . . . Ear Mites

Auralgan

Solves the Problem Rapidly and Effectively

The majority of ear infections when brought to the veterinarian for treatment are in the chronic stages with the external auditory canal filled with detritus and very painful but there are many cases less severe but annoying, usually not recognized by the owner of the animal that needs treatment. In some sections ear mites particularly in cats are so prevalent as to make treatment almost a routine necessity for these animals when received in a veterinary hospital for any purpose.

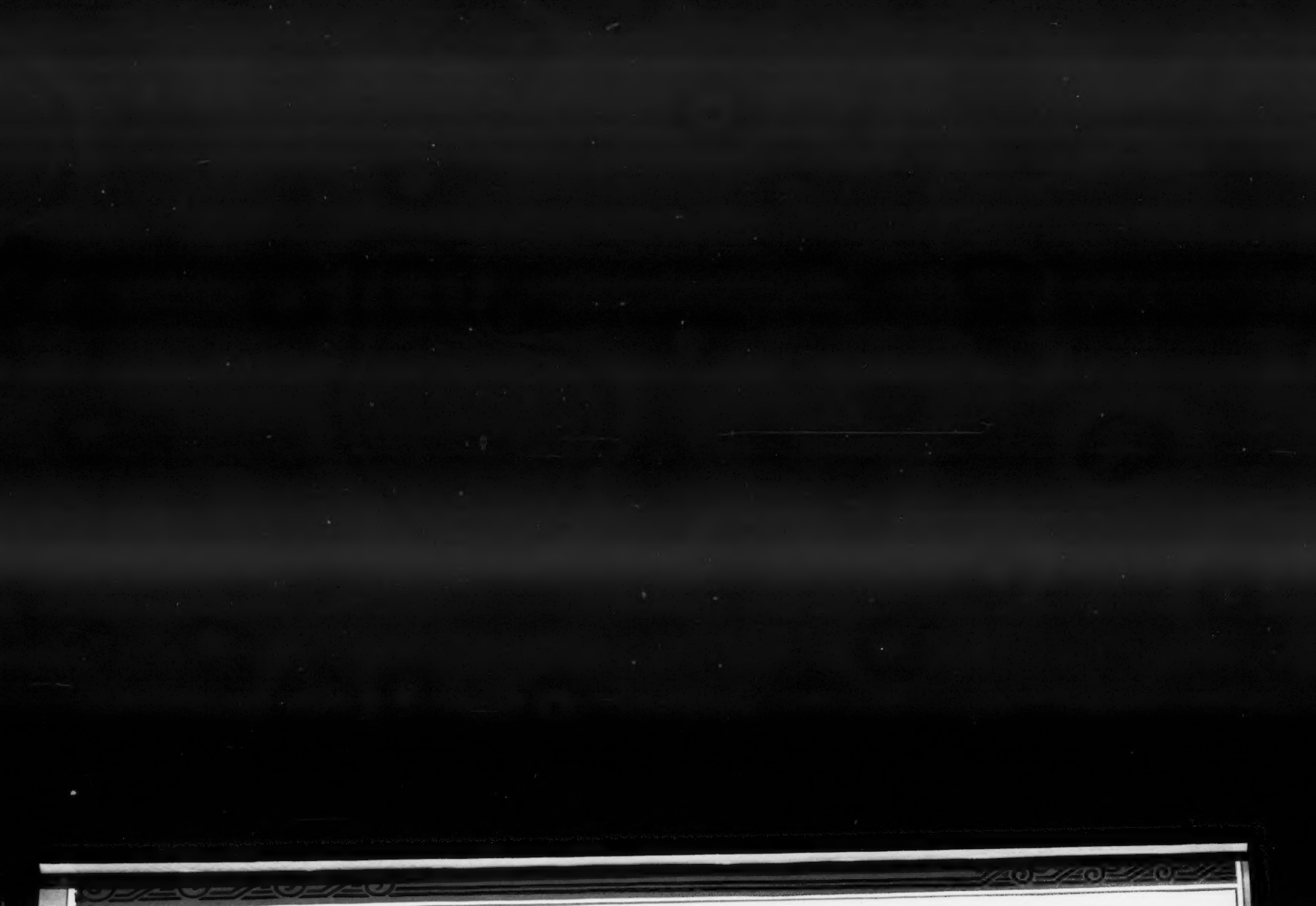
Whether aural infection be due to faulty metabolism, filth, trauma, or a primary invasion of bacteria or parasites Auralgan has been found highly successful in quickly and effectively remedying the situation.

Auralgan ear medication is based upon the principle of osmosis. This original property available only in Auralgan is due to the specially processed anhydrous glycerol, of the highest obtainable specific gravity, synergistically combined with 5% pyrazolon. Being highly hygroscopic, Auralgan quickly dehydrates the aural membranes and liquefies pus, serum and organic matter thus relieving the congestion and removing the cause of irritation. Its analgesic and antiseptic properties alleviate the pain and allay inflammation. It contains no phenol and will not "burn" the ear. It is entirely safe to use.

Use Auralgan in your next ear case mild or stubborn. If you have a case that has resisted other treatment use Auralgan for convincing evidence of its superiority over other methods of treatment.

Merillat-Laine Company, Inc.

1827 South Wabash Avenue — Chicago, Illinois



U

VOL

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXV MARCH, 1940 No. 3

Published Monthly by the

VETERINARY MAGAZINE CORPORATION

7632 S. CRANDON AVE., CHICAGO, ILL., U. S. A.

$4.00 a year; per copy 50 cents; Special Issues $1.00

All matter appearing in this publication is copyrighted. No part of it may be reproduced without specific permission. Permission will be given if the purpose is unobjectionable. If there be any question as to the propriety of reproduction the author will be consulted.

D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago, Ill.
Telephone South Shore 7160

H. J. MOSTYN, *Eastern Representative*
1265 Broadway, New York, N. Y.
Telephone Murray Hill 4-4037

COPYRIGHTED 1940 BY VETERINARY MAGAZINE CORPORATION

The Secretary of Agriculture reports that for 1939, cash income from farm marketings was $7,625,000,000, and from government payments, $675,000,000; a total of $8,300,000,000. Corresponding figures for 1938 were $7,627,000,000 and $482,000,000; a total of $8,109,000,000.

* * * *

The Arkanas Agricultural Experiment Station made observations over a one-year period of the egg production and food utilization of hens treated by kamala and nicotine sulphate, and found that they were no better than in comparable hens not so treated.

* * * *

In the annual report of the Idaho Agricultural Experiment Station for 1937, the following results were reported: (1) Mastitis is not transmissible by infected milk filtrate. (2) Sulfanilamide causes the disappearance of streptococci from milk of cows with mastitis, but they reappear on cessation of treatment. (3) The susceptibility to fowl paralysis of day-old chicks from a clean flock is very great, but declines sharply within a few weeks; an affected flock acquires resistance. (4) Orchard grass is rich in manganese and consequently valuable for the prevention of perosis.

Pullorum disease was responsible for over 50% of the disease outbreaks in turkey flocks in Los Angeles County, California, during the past year. A respiratory disease closely resembling laryngotracheitis occurred in several large commercial flocks.

* * * *

Hans Zinsser of the Harvard Medical School, author of "Rats, Lice and History," has developed a successful vaccine against European typhus. The Rickettsiae organisms from which the vaccine is made, are grown in a chick embryo and agar-agar culture.

* * * *

Operators of locker plant refrigerators state that farm families that have used lockers have increased their use of meats uniformly. They attribute this increase to the improved quality and decreased cost of the meat thus made available for rural dwellers.

* * * *

The throw-away medical journals should disappear entirely from the medical scene. They represent a cancer in the field of medical publications. The entire medical profession has a responsibility in relationship to these publications.—*Morris Fishbein, M.D., Edt. Jnl. A. M. A.*

Swamp fever (infectious equine anemia) is practically a world-wide disease.

* * * *

The farmers of the United States receive 45 million dollars annually for cereals and meats used by dog food manufacturers.

* * * *

"Dogs of War"

The record of the use of dogs in war is as old as history and as new as the present European war. Five thousand years ago the Egyptians wrote of their effectiveness against the enemy. The Greeks, Romans, Gauls and Celts of ancient civilizations trained dogs not only to attack foot soldiers but to harass cavalry. With the invention of gunpowder and the improvement of firearms the military use of dogs slowly changed from attacks on troops to, in the World War, a signal service to warn of the approach of enemy troops, a messenger service in which they excel as couriers and for transportation, to convey food and other supplies to far forward installations, to draw litters on which casualties are removed from the field of battle, and also to locate hidden or helpless wounded.

In the present European war the planned use of dogs far surpasses that of 25 years ago. In 1914 Germany possessed only 600 dogs that had been trained for military use; at the beginning of the present war the Reich is reputed to have had 50,000 so trained, and facilities for training 2,000 monthly. In 1914 England had no army dogs, but quickly adopted their use, and by the end of the war had employed several thousands; it is reported that a large number are now being trained for use in the present war. The French are using numerous dogs in the Maginot Line. Dispatches from Finland speak of sledge dogs with the army, and pictures have been shown (before the outbreak of war) of dogs descending in parachutes from Russian army planes for the use of machine gun companies.

It requires from three to eight months to train a dog for service at the front. Airedales are the first choice for their courage, reliability and hardiness; sheep dogs, mastiffs, retrievers and collies and other breeds are also used.

There are a total of 177 locker plants in Wisconsin, according to a report of the Director of the Agricultural Experiment Station for 1939. They vary in the number of lockers from 20 to 620. It is estimated that 10% of the farm families in Wisconsin now possess rented lockers. Ninety to 95% of the products stored in the lockers are meats.

* * * *

Twenty Years Ago

Twenty years ago Remlinger stated in the annual report of the Pasteur Institute (1919) that rabies virus is capable of diffusing from the head of a dog or rabbit into physiological salt solution or glycerin, and subsequently into a new head, kidney, or liver immersed in the liquid. He discussed the bearing of this phenomenon on the nature of rabies virus, and proposed the theory that filterable viruses occupy an intermediate position between the visible microorganisms and the colloids, diastases, or toxins. The lessened virulence of rabies vaccine on passage through a filter of very fine pores he attributed to a change into the finer colloidal form. The theory that viruses are not living organisms is not entirely new.

* * * * *

Swine Typhus

Donatien and Lestoquard observed a new infectious malady of swine in the experimental herd of the Pasteur Institute of Algiers. The onset of the disease was sudden, the course rapid, death occurring in most cases in three days, and the mortality high, only one aged sow surviving among the more than 20 animals attacked. Affected animals were in a state of complete collapse, with a temperature of about 106°F.; a few dark, lenticular spots were observed on the upper interior surfaces of the legs. The most striking lesions on postmortem examination were the enormously enlarged, hemorrhagic spleen and the dark or purplish red color of the gastric mucosa. Experiments showed the cause of the disease to be a filterable virus affecting only swine. The name swine typhus is proposed for the malady.

In treating horses for intestinal parasitism, oil of chenopodium will have less toxic effect if followed by one pint of linseed oil combined with from one to two quarts of bland mineral oil instead of a quart of straight linseed oil.—*W. J. Gibbons.*

Bang's Disease

In controlling Bang's disease we do not subscribe to the theory that the disease under range and semi-range conditions is best controlled by the blood testing and slaughter method. We realize that this method has its place in controlling the disease in small pasture herds. We believe, however, that the disease may best be controlled under most Montana conditions, by blood testing the breeding herd in the fall of the year and vaccinating calves with bovine abortion vaccine immediately after they have been weaned or when they are between the ages of four and eight months. Breeding cattle may be blood tested when they are gathered in the fall without much trouble and when tested at this time, practically all infected animals will be determined by the test. This does not hold true under Montana beef breeding conditions when cattle are blood tested in the spring months during the calving season.—*W. J. Butler* in *Annual Rept. of the Montana Livestock Sanitary Board.*

Hog cholera still continues to make its appearance in Montana, principally in hogs fed swill picked up in cities or at various camps. The Montana Livestock Sanitary Board has revised its regulations governing the importation of hogs and now requires that all hogs shipped into the state must be shipped into quarantine for a period of not less than 21 days. We trust that this new regulation will materially aid in the prevention of the importation of the disease; however, very little hog cholera has been imported in live hogs. Most of the outbreaks, as we have previously reported, have been due to the ingestion of swill containing infected pork scraps.—*Annual Rept. of the Montana Livestock Sanitary Board.*

Rabies does not exist in the State of Montana, and has not been reported in the state since 1925.—*W. J. Butler.*

Research workers in the Bitter Root Valley laboratory of the U. S. Public Health Service at Hamilton, Montana, have discovered a new febrile disease and an effective vaccine for its prevention. They term the new disease Rickettsia diaporica. It is a tick-transmitted disease. The vaccine is made from germs from an infected tick.

Leaders and Others

Several years ago the ethical producers of anti-hog cholera serum and virus launched an organization known as the American Foundation for Animal Health, Inc. The purpose of the organization was to distribute information to the live stock raisers of some 20 central and midwestern states that would enable them to lessen their losses from disease and make live stock raising in that area more profitable. The success of the project was immediate and striking. Live stock raisers welcomed and to a considerable extent used the information supplied; newspapers were willing and in many cases eager to publish it; thus it attained a wide distribution, and veterinarians everywhere approved the project, declaring it benefited their clients and themselves.

About a year ago the other kind of serum producers—the direct sellers, the worm powder, mineral feed, and farm remedy people—organized the Animal and Poultry Foundation of America, Inc. W. J. Kennedy, So. St. Joseph, Mo., is president; George Wrightman, Des Moines, Ia., executive secretary, and S. D. LeGear, St. Louis; W. G. Peters, Kansas City; W. L. Beebe, St. Paul; H. A. Marshall, Atlantic, Ia.; J. M. Rice, Omaha; R. E. Hedges, Kansas City; J. L. Elliott, Oelwein; E. F. Fox, Des Moines; Frank R. Jones, Fort Worth, Tex.; Warren Churchhill, Burlington, Ia.; E. P. Quirin, Marcus, Ia.; J. E. Salsbury, Charles City, Ia.; and John E. Swaim, Chicago, are directors.

Beebe and Salsbury are veterinarians.

A Proposed New Practitioners' Organization

Drs. H. W. Young and J. C. Flynn, Kansas City, S. L. Stewart, Olathe, Kans., C. W. Bower, Topeka, Kans., and a number of other veterinary practitioners in the territory adjacent to Kansas City are sponsoring the organization of a national veterinary practitioners' association to be known as The American Foundation of Veterinary Therapy.

In the history of veterinary organization in this country there have been various periods when practitioners felt that they were inadequately represented by the national association, and at least four instances prior to this one when the organization of a practitioners' association was undertaken. Two such associations were launched in the middle 80's, one by T. E. Daniels of Chicago, publisher of the *United States Veterinary Journal,* who thought that the interests of the national association (U. S. V. M. A.) were centered too much in the East and neglected the profession west of the eastern seaboard, which at that time was composed of practitioners exclusively. The plan of the new association was similar to that of the A. V. M. A. at the present time; *i.e.,* it was made up of component state organizations. A great gain from this effort was the organization of most of the older state veterinary associations — New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Missouri, and others. The component state organizations lived on, but the national association soon folded up, probably because the U. S. V. M. A. took an immediate interest in midwest veterinarians. Prior to 1884 it had not held a meeting west of the Appalachian mountains. In that year it held a meeting in Cincinnati, in 1890 and again in 1893 in Chicago, in 1895 in Des Moines, in 1897 in Nashville, and in 1898 in Omaha.

J. C. Flynn

The other national veterinary association which began in the 80's was organized by Charles M. Meyer, a New York City practitioner. It was organized in protest against the U. S. V. M. A., and was frankly antagonistic to it. Meyer thought that the older national association was completely dominated by men connected with the two schools then existing in New York City, that it had no interest in practitioners and no concern for their welfare. The organization held 10 annual meetings, but made little headway. Meyer continued as president until his death in 1896, following which no further meetings were held.

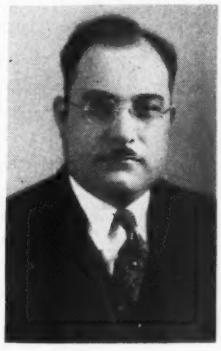
Although there was much talk at times of the need for a practitioners' association, no further steps were taken to organize one until the 58th annual meeting of the A. V. M. A. at Columbus, Ohio in 1920, when a national association of practitioners was

S. L. Stewart

proposed and the names of some 200 who desired to become members procured. The protest at this time was similar to that of Meyer, that the national association was dominated by the schools, and, in particular, that a practitioner had small chance of being elected president. Although only one practitioner (or two, counting one engaged part time in practice) had been elected president of the A. V. M. A. in the ten years preceding, in the next decade five practitioners were elected to this office. The organization of the practitioners' association proceeded no further than the action taken at the Columbus meeting.

A half dozen years ago, the organization of a fourth national association for practitioners, this time for those engaged in small animal practice, was undertaken. It was opposed by the then president of the A. V. M. A. on the ground that it would injure the small animal practice section of the A. V. M. A. This guess proved wrong, since the small animal practice section of the A. V. M. A. has improved materially since the American Animal Hospital Association was organized.

It is a matter of interest and significance that the organization of the American Foundation for Animal Therapy was undertaken in the same district where, for 25 years, the Missouri Valley Veterinary Association—almost exclusively a practitioners' association — flourished. At one time the Missouri Valley Veterinary Association had more members than the A. V. M. A. It was a vigorous association that dominated veterinary matters in six or seven states. The late Dr. R. C. Moore repeatedly urged upon the association that it change its name, extend its organization to include all of the United States, and become exclusively an organization for veterinary practitioners. However, the members of the association took much pride in its name, its record of achievement, and its size, and would entertain no suggestions for a change. Some 15 years ago it went into rapid decline and soon ceased to exist. It would seem that those now interested in the new organization missed an opportunity when they permitted this to happen.



C. W. Bower

Sixty-five per cent of the veterinarians in the United States are engaged in practice, and an association devoted exclusively to their interests can doubtless accomplish much if it works in coöperation with the national and state associations. While each branch of the veterinary profession has its special interests and the practitioner branch is no exception, the interest of each branch in the welfare of the profession as a whole is of greater moment to it than its own particular interests. No branch of the profession can stand alone.

It is planned to hold an organization meeting in Chicago or Kansas City within the next 60 days. It is expected that thereafter a central statistical office will be established to assist practitioners with their problems, particularly problems of a public relations nature. Holding annual meetings and clinics is not contemplated.

There are already national associations of veterinarians in the B. A. I., in regulatory work, and in research. No one can deny practitioners an equal privilege. It is stated by the organizers of the new association that it will work in the closest harmony with the national association and with all units of organized veterinary medicine. On this program all must wish them success.

The Swine Trichinosis Problem

The subject of swine and human trichinosis is a difficult one to shush. Leaders in the swine industry and the packers are making great efforts, only mildly successful, to prevent newspaper comment on the question with its almost inevitable sensationalism. The federal Bureau of Animal Industry is active and sympathetic. Apparently the federal, state and municipal public health services would prefer to maintain the discussion on a scientific plane, but seem inclined to accept the help of the public press if action to alleviate present conditions cannot be had otherwise. Veterinarians, as is natural, are prone to side with the swine industry, but not to the extent of suppressing scientific facts to the harm of the public for the wholesomeness and adequacy of whose food supply they are in no small degree responsible.

Discussions of alarming import from public health and university sources are reaching the public press with increasing frequency. Seats on the lid are becoming uncomfortable. At the recent annual meeting of the American Association for the Advancement of Science, Nelson of Rutgers presented a paper excerpts from which have been widely published. It overplays the facts as much as the opposition have minimized them. Such statements as "the trichinosis problem involves some 17 million persons" and "every seventh to tenth garbage-fed pig slaughtered in this country today is wormy, infected with the most dangerous worm known to man" and "humans eating the meat of such animals, unless it is thoroughly cooked, may develop the serious and often fatal malady trichinosis," cannot fail to mislead and needlessly alarm the uninformed. They set us to muttering cuss words in our beer. That convenient and ever ready answer, "Cook pork thoroughly," is demoted to a belly laugh. The public will not take kindly to cooked worms. Strictly construed, Nelson's statements can be substantiated. Played up in newspaper headlines, as they or similar sensational statements inevitably will be sooner or later if something effective is not done about feeding raw garbage to swine, they will do infinite harm to the swine industry, prove costly to the packing industry, embarrassing to the veterinary service, and harmful to the general public in lessening the consumption of wholesome pork.

At the annual meeting of the United States Live Stock Sanitary Association in Chicago in December, a resolution putting the association on record as opposed to the feeding of raw garbage on the ground that it constitutes a dangerous means of spreading disease among animals, was laid on the table. More shush-shushing instead of meeting a problem that is facing regulatory officials.

The problem of trichinosis in both man and swine is intimately bound up with the commercial feeding of raw garbage. Grain-fed hogs carry the infection in a much lower percentage, and in them, so far as is known, the origin of the parasitism traces back through kitchen scraps or otherwise to the principal reservoir of the disease, commercial garbage feeding plants. The solicitude of the 94% of the swine industry that does not feed raw city garbage for the 6% that does feed it is difficult to understand. From a disease control standpoint, the feeding of raw garbage is indefensible; from an esthetic viewpoint it is disgusting, and that is a matter of concern in building or holding a market for pork. Independent of the trichinosis question entirely, the swine industry would be materially benefited if the pork-consuming public didn't see some of the things it sees and smell some of the things it smells when passing some of the filthy swine lots that abound or the garbage feeding plants that herald their presence for miles.

Other than some local action against garbage feeding plants to abate the nuisance they commonly constitute, the only effective action to curb them has been taken

by the large packers who have recently begun to discount the price paid for garbage-fed hogs fifty cents to a dollar per hundredweight, on the ground that they produce pork of inferior quality. If the large packers constituted the only market for garbage-fed hogs, this would be a serious blow to commercial garbage feeders and an important measure for the improvement of pork products and increased use of pork. Unfortunately, this very commendable action of the packers is likely to work out to the disadvantage of the public health and an increase in the amount of human trichinosis by shunting garbage-fed hogs to local uninspected abattoirs. The danger of acquiring trichinosis from pork processed in a plant having federal meat inspection is exceedingly small; from uninspected plants, however, where no measures are taken to destroy any trichinella that may be present in cuts of meat that are sometimes eaten raw and frequently served for food insufficiently cooked, there is a risk, as is shown by public health statistics. The statistics of the federal public health service and the federal veterinary service—the two departments of the national government directly concerned—differ materially in their implications. One guess as to which will attain the readier acceptance by the press, the radio, and the public if and when the lid blows off!

It is not well to rely very much on statistics in evaluating the importance attached to health measures in the estimation of the public. If mortality statistics be the criteria, rabies, undulant fever, and tularemia, like trichinosis, are unimportant to the public health. But the public suffers disease as individuals, not *en masse*. A high or low incidence of the disease is of no interest to the individual suffering from rabies, or seized with a serious attack of trichinosis, or incapacitated for several months by undulant fever. The fear of acquiring trichinosis must be removed if pork is to occupy the place in the general food supply to which its low cost and high nutritive qualities entitle it. The federal public health service gives every evidence of being in earnest in its efforts to lessen the incidence of trichinosis. Statistically, there are more important health problems demanding attention, but among others it has taken up trichinosis. State and municipal health departments are prone to follow the lead of the federal department and their facilities for publicity are unequaled. The swine industry, the meat processing industry, and the veterinary service of the country, official and private, must meet squarely the problem of swine trichinosis, which as before stated is the problem of raw garbage feeding, or suffer unnecessary injury. "Shush" is no answer. Decrying it is futile. Anyway, what's so difficult about it? No other civilized country permits the feeding of raw garbage to a food-producing animal. It doesn't cost too much to cook garbage in Canada or Europe; and if, as alleged, it costs too much here—why, garbage makes good fertilizer, and there is plenty of grain, pasture, and milk products available for swine feeding. There has already been one ban placed on the use of its flesh because the hog was a scavenger, and it has endured for 3500 years. Let us not risk another by making this valuable food animal ten times more a scavenger than it was in the time of Moses.

* * * *

When the Los Angeles County (California) Live Stock Department began to supervise garbage feeding there were approximately 20,000 hogs in the county on 24 ranches. At the close of the fiscal year 1938-39 there were slightly in excess of 40,500 hogs being fed garbage on 44 ranches. Of these ranches, 33 were operating under county permit, three were operated by governmental institutions, and eight are located within the incorporated areas of cities. Three ranches in the way of rapid urban development suspended operations during the year and moved into Orange County. Six additional permits were granted by the Board of Supervisors, five of which were for new locations and one because of change of ownership. Eighteen new applications were received and permits granted to transport garbage.

Annual Report of the Chief of the B. A. I.

THE work of the Bureau of Animal Industry, United States Department of Agriculture, during the fiscal year ending June 30, 1939, dealt as heretofore with the prevention, control and eradication of animal diseases and parasites, the administration of various federal live stock laws, inspection work, and research. The report occupies 82 closely printed pages from which the following is abstracted.

■ Expenditures amounted to approximately $18,500,000. One hundred and seventy-five thousand pieces of incoming and an equal number of pieces of outgoing mail were handled. The Bureau library circulated 41,666 periodicals and 4,659 books among the Bureau staff in Washington. The library periodical card index contains 280,000 author and subject cards.

The number of regular civil service employes of the Bureau at the end of the year was 4,285. Of the 2,044 professional and scientific employes, 92% (1,880) were veterinarians. Students graduating from accredited veterinary colleges numbered 471, an increase of 56 over the preceding year. The total enrollment in these schools was 2,480, an increase of 23 over 1938.

Publications prepared by the Bureau and published by the government included 55 new and revised documents. In addition Bureau employes contributed 215 manuscripts to periodicals and scidentific organizations not connected with the government.

Dr. Adolph Eichhorn was appointed Director of the Animal Disease Station at Beltsville, Md., Oct. 18, 1938, and the station began the production of all antigen used in official Bang's disease control and eradication work.

Under the provisions of paragraph 1606 of the Tariff Act of 1930, certificates of pure breeding were issued for 13,811 breeding animals imported during the fiscal year. The total importations during this year were: cattle, 10,051; horses, 483; sheep, 2,406; goats, 1; swine, 59; asses, 1; cats, 13; dogs, 797. There was a decrease of approximately 10% in the total importations of live stock during this period as compared with the importations for the previous fiscal year.

Inspection of cattle, sheep, swine, and goats, and meat products from them and, in a limited way, of horses and horse meat products, was conducted at 684 establishments located in 249 cities and towns. Inspection was inaugurated at 21 establishments and withdrawn from 38. The withdrawal of the inspection was made necessary at 37 establishments on account of discontinuance of foreign commerce, and at one establishment on account of violation of regulations. At the close of June 30, there were 646 establishments operating under inspection in 242 cities and towns.

■ Samples of biological products, cultures, and viruses intended for use in the preparation of veterinary biologics were examined. During the year 491 representative samples of serums, antitoxins, vaccines, bacterins, aggressins, filtrates, and toxoids were tested for purity, potency, and safety. Of these, 320 were approved and 171 were found to be unsatisfactory. Of 189 cultures and viruses examined for conformity to type, 135 were approved and 54 were found to be unsuitable for the preparation of veterinary biologics.

At the close of the year supervision was exercised over 74 licensed establishments, distributed among 50 cities and towns in 21 states. At that time also, 36 establishments were engaged in producing only anti-hog cholera serum and hog cholera virus, 32 were producing other biologics only, and six were producing both classes of products.

Intensive study was made of all veterinary biological products with special reference to their derivation, composition, nomenclature, labeling and the like. The purpose of this study was to insure that labels on containers of these licensed products, as marketed, will not be false or misleading in any particular. This step

necessitated rather drastic revision by licensed establishments of the nomenclature, composition, and labeling, particularly for antibacterial serums and mixed bacterins.

■ Since last year's report on calfhood vaccination against brucellosis, an additional year's experience in the field tests, begun in 1936, on approximately 10,000 calves vaccinated in 261 herds has furnished further encouraging results. Data accumulated on these tests show that the vaccination of heifer calves in infected herds increases their resistance to infection during their first and second pregnancies and also, in the case of the limited numbers for which data are available, through their third pregnancy. It is deemed advisable, however, to continue observations on these herds before arriving at definite conclusions as to the dependability of calfhood vaccination as a control measure.

Agglutination blood tests for Bang's disease were applied to 7,591,398 cattle in 724,613 herds. A considerable number of these were retests. Of the total number of cattle tested, 219,165, or 2.9%, were declared to be reactors to the test. During the previous fiscal year the percentage of reactors was about 4%.

Most of the bovine tuberculosis work done consisted in the testing of cattle under the area plan. Altogether, 11,186,805 tuberculin tests were applied to cattle. The percentage of reactors was 0.5, which was the lowest degree of infection found throughout the project, which began in 1917. The work was conducted from 46 field stations. The state and territorial authorities employed an average of about 300 veterinarians throughout the year, and counties employed 162 veterinarians on full time. About 293 veterinarians were employed by the Bureau, including those working at a per diem rate, on a part-time basis, and 126 local helpers were employed to assist them in the field work.

The federal appropriation for tuberculosis work was $2,803,000, and the combined state, territorial, and county appropriations were approximately $4,000,000.

Approved veterinary practitioners throughout the 48 states continued to conduct testing of cattle for interstate shipment. On June 30 there were 11,185 veterinarians on the approved list. These men tested for interstate shipment 18,358 lots of cattle, containing 195,156 cattle, of which 0.05% reacted to the tuberculin test.

John Robbins Mohler, Chief of the Bureau of Animal Industry

The eradication of the cattle-fever tick was conducted in cooperation with state, county, and territorial officials and cattle owners of the south, Puerto Rico, and the Virgin Islands. At the close of the fiscal year, 226 veterinarians and other Bureau employes were working in cooperation with 132 state and 26 county employes engaged in the project. The area remaining under federal quarantine in continental United States had been reduced to 2% of its original size by June 30, and is now confined to parts of Florida and Texas.

■ The studies on physiology of reproduction with mares and stallions, which were begun in 1937 and have been conducted jointly with the Montana and Missouri stations, were carried on principally at the station at Miles City and at the Missouri station at Columbia. At Miles City, obser-

vations during 1937-39 of 196 estrual periods for 80 mares of the light and draft

Adolph Eichhorn, Director, Animal Disease Station

types showed that duration of heat extends from one to 37 days, the average being 5.3 days. Maximum sex desire occurred one to two days before and at the time of ovulation, with estrus terminating 24 to 48 hours after ovulation. "Split" estrus (discontinuous or intermittent heat) was observed, during 28 of the estrual periods, in 31.3% of the mares. "Physiological" estrus (heat in which ovulation and physiological changes of the vagina and other reproductive organs occurred but no sex desire was exhibited) was detected in 13.8% of the mares. The studies also showed that the average time interval between foaling and the first, or foal, heat, was 11.4 days, with a range of two to 30 days, and that the foal and regular heat periods were of the same average length. In 60% of the cases under observation, ovulation was found to occur in the left ovary.

A new type of artificial vagina—a lightweight instrument made principally of rubber—was developed for the collection of equine semen. It has been used successfully at both Miles City and Beltsville. By the use of this vagina and its equipment, it is possible to separate the semen into fractions at the time of ejaculation and to collect as much as 317cc of semen at one ejaculation.

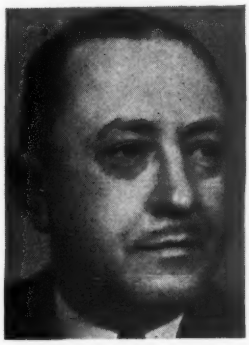
In a rather severe epizotic of equine encephalomyelitis of the western type at Miles City during the summer of 1938, 39 animals were affected. Horses of Nonius breeding were much more susceptible to attack than those of other breeding.

■ Thirty veterinarians were assigned to the investigation and control of outbreaks of hog cholera and allied skin diseases. Through their visits to farms and attendance at meetings, these Bureau veterinarians had opportunity for 54,991 farm inspections and consultations relating to swine diseases with farmers, veterinarians, state officials, and others.

Nearly 2,300 diaphragms from as many farm-raised hogs reported to have been fed principally on grain were examined for trichinae. Only 0.52% were found to be infected, the number of larvae in individual diaphragms ranging from one to about 185,000. Of nearly 1,000 diaphragms obtained from as many hogs fed cooked garbage, none were infected. These data show that only a very small proportion of grain-fed hogs acquired trichinae from one source or another, and that cooking of garbage before it is fed to hogs prevents the spread of trichinae to these hosts.

In the study of the vitamin B_1 requirements of young pigs of suckling age, it was found that excellent growth can be obtained on a diet consisting of casein, sugar, minerals, cod-liver oil, and lard, provided dried whey and dried pork liver are also included. The need of pigs for vitamin B_1 was shown when the whey and liver were autoclaved or treated with sulphur dioxide. Autoclaving these feeds led to a variety of effects, including convulsions, paralysis and lameness, scours, and loss of appetite. Additions of different levels of thiamin (synthetic vitamin B_1) to deficient diets promoted better appetites and growth in most cases, but did not make possible the same growth and well-being as did a diet of corn, a protein supplement (composed of 50 parts of tankage, 25 parts of linseed meal, and 25 parts of alfalfa leaf meal), and mineral mixture.

No clear-cut pathological picture was obtained from the autopsy and histological



Harry W. Schoening, Chief, Pathological Division

findings. It is evident that the treatment of the whey and liver caused destruction of one or more essential factors. The vitamin B_1 content of the meat appeared to reflect the vitamin B_1 content of the diet.

In a 10-year study on the immunization of suckling pigs against hog cholera, more than 10,000 suckling pigs were treated against hog cholera by the serum-virus inoculation, in varying dosages, on six different farms in widely scattered areas of the country and under different climatic conditions. Pigs from practically all breeds of swine were used in the tests. The results show that pigs inoculated while nursing immune sows can be given a lasting immunity. Immunization of suckling pigs can be done at a decreased cost because of the use of less serum. The pigs are protected at an early age against the disease, and the treatment does not interfere with normal growth. Care should be taken to have the pigs in good health when the simultaneous inoculation is administered to avoid any complications that might arise owing to mixed infection.

Further studies were made on arthritis in swine and lambs retained on postmortem inspection. Of 342 swine specimens examined, 200 proved to be positive for erysipelas. More than 90% of the arthritic conditions in swine and lambs resulted from swine erysipelas infection.

■ In a study of the duration of pregnancy in range ewes at Dubois, analysis was made of 658 gestation periods in Rambouillet ewes for the 1937-38 season. The duration of pregnancy ranged from 142 to 159 days with an average of 151 days. Preliminary

Benjamin Schwartz, Chief, Zoological Division

results indicate that ewes carrying twins have a shorter duration of pregnancy than those carrying single lambs. Ewes lambing early in the season had shorter durations of pregnancy than ewes lambing late. As the duration of pregnancy increased, birth weight of the lambs increased also.

A varying number of lambs in the Beltsville flock have become unthrifty during the hot summer months in spite of abundant pastures, grain feeding, and measures to control internal parasites. Rather heavy death losses occurred among the lambs during the summer of 1938. Autopsies and blood examinations of affected animals indicated that many of them were markedly anemic. Drenching affected animals with iron salts was followed by improvement in the blood, increased appetite, and resumption of growth. These preliminary findings suggest that nutritional factors may be involved in this condition.

Sheep-scabies eradication continued to

progress as in previous years. Total inspections in the field and supervised dippings numbered 14,963,409 and 1,013,389, respectively. Flocks in which infection was found included 294,518 sheep. Approximately 90% of these infected sheep were reported from Louisiana.

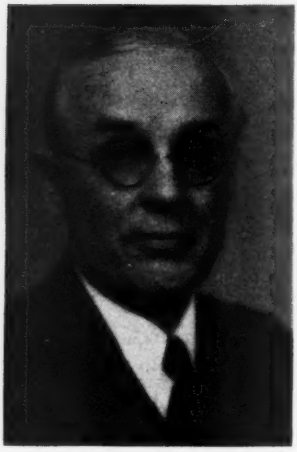
Experiments with commercial phenothiazine as an anthelmintic showed that at a dose rate of 0.5gm per pound of body weight, this chemical removed, from eight sheep, 91% of the nodular worms, 76% of the hookworms, 100% of the lesser stomach worms (Ostertagia), and at least 80% of the common stomach worms.

■ Poultry-disease investigations included principally work on leucosis (fowl paralysis) and avian encephalomyelitis (epidemic tremor).

An outbreak of a disease in a brood of 300 young guinea fowl, resulting in the death of all the birds, was found to be pullorum disease. This is the first report of the occurrence of pullorum disease in the guinea fowl.

A large number of chemicals in the form of dusts were tested, and it was determined that barium antimonyl tartrate inhaled by chickens and turkeys in the form of dust was highly effective for dislodging gapeworms. About 1,125 chicks and 236 turkey poults were subjected to this treatment, the average efficacy being 92% for the removal of gapeworms from chicks, and 96% for the removal of these parasites from turkey poults. In order to determine whether a large number of birds can be treated at one time, a galvanized-tin box, 29 inches long, 28 inches wide, and 18 inches deep, was constructed. The box was provided with a solid movable lid except for a 6-inch hinged flap at one end which permitted the insertion of a dust gun for spreading the powder throughout the box. It was determined that 50 one-month-old birds could be treated at one time in a period of 20 to 30 minutes, the amount of the chemical needed for this purpose being 30gm.

The technique previously employed in artificial insemination of chickens was successfully applied to turkeys. Thirty-one turkey hens, artificially inseminated with



Edward C. Joss, Chief, Meat Inspection Division

0.05cc of turkey semen at intervals of one, two, three, and four weeks, laid 948 eggs with an average fertility of 80%. A valuable old tom which, in a pen of 10 hens, fertilized only 7.5% of the eggs, gave 88.4% fertility when artificial insemination was used.

■ Organization of the Bureau:

John R. Mohler, Chief.

Adolph Eichhorn, Director, Animal Disease Station.

Hugh C. McPhee, Chief, Animal Husbandry Division.

Paul E. Howe, Chief, Animal Nutrition Division.

Robert M. Chapin, Chief, Biochemic Division.

S. O. Fladness, Chief, Field Inspection Division.

Edward C. Joss, Chief, Meat Inspection Division.

A. W. Miller, Chief, Interstate Inspection Division.

Harry W. Schoening, Chief, Pathological Division.

W. M. MacKellar, Chief, Division of Tick Eradication and Special Diseases.

A. E. Wight, Chief, Tuberculosis Eradication Division.

D. I. Skidmore, Chief, Division of Virus-Serum Control.

Benjamin Schwartz, Chief, Zoological Division.

C. P. Fitch Succumbs to Heart Attack

Clifford Penny Fitch, 55, was born in New York State and died at his home in Saint Anthony Park, Minn., Jan. 12, 1940, from an attack of heart disease.

Doctor Fitch was graduated from Hamilton College with the degree of B.S. in 1906,

Clifford Penny Fitch

M.S. in 1909, and from the New York State Veterinary College in 1911. He was successively assistant, instructor, assistant professor, and professor of bacteriology in the New York State Veterinary College from 1909 to 1917, and chief of the division of veterinary medicine in the University of Minnesota since 1917. He was co-author with V. A. Moore of "Bacteriology and Diagnosis," and contributed many articles to veterinary and other scientific publications. Probably the last article he wrote was "The Value of Accurate Diagnosis of Poultry Diseases," published in the December, 1939 issue of VETERINARY MEDICINE.

Long active in veterinary organizations, Doctor Fitch was president of the A.V.M.A. 1933-34, and for many years secretary of the Minnesota V.M.A. He held many committee assignments in both organizations and in the U. S. Live Stock Sanitary Ass'n.

Doctor Fitch is survived by his widow and two sons, one of whom, James A. Fitch, of Truman, Minn., is a veterinarian.

R. F. Eagle a Victim of Pneumonia

Richard Fred Eagle was born in Kansas City, Kansas, 59 years ago. He was one of

Richard Fred Eagle

seven brothers of whom four became veterinarians. He died of pneumonia in the Roseland Community Hospital, Chicago, January 15, after an illness of five days.

Doctor Eagle was graduated from the Kansas City Veterinary College in 1901 and immediately accepted employment by the British remount service on a transport taking a shipload of mules from New Orleans to Capetown for the British army during the Boer war. Returning to the United States *via* London, he entered the B. A. I. but soon resigned to accept a position with Schwarzchild and Sulzberger. His promotion in S & S and later in Wilson & Co. was rapid, until in 1931 he became vice president.

Doctor Eagle possessed a genius for making and keeping friends. Few in the packing industry were more widely known and although engaged in other work for more than 30 years, he lost none of his veterinary contacts and continued throughout that period to attend veterinary meetings, often contributing to the programs.

Since 1937, Doctor Eagle had been president of the Institute of American Poultry Industries. He was also a director of the American Butter Institute.

The Border Between Life and Death

By A. ASCOLI, New York City

WE, WHO are living in an epoch in which fantastic technical advances have been made; we who have learned to shorten distances first by means of railway and later automobile and airplane; we who have succeeded in penetrating with x-rays into the depths of organisms, thus making visible bone fractures, damaged lungs, and even the beating of our hearts, and cured with simple emanations of an element such as radium, tumors which resist all other therapeutic attempts; we who, through the medium of radio, have become accustomed to hear sound waves produced in every part of the world and are just beginning to see by television, to catch in their material contours events unfolding beyond the reach of our eyes; we have until now taken for granted the dogma expressed in the words *"omne vivum e vivo,"* which means that every living thing traces its origin from another living thing.

This fundamental concept of biology has also been extended to microbiology, where in microbes, that is, in those beings at the limits of visibility of our most powerful microscopes, we have learned to recognize the causative agents of infectious diseases. Undoubtedly, tuberculosis is due to the slender rod which Koch discovered and grew in test tube cultures, and the same is true for any number of other pathogenic germs such as diphtheria, typhoid fever, pneumonia, anthrax, glanders and so forth. One may observe the capacity of these microorganisms to reproduce themselves by simple fission. One may observe in some microbes like *Bacillus typhus, Vibrio cholerae* mobility as they dart about under the microscope with amazing rapidity. This faculty, coupled with their ability to reproduce the same disease from which they are isolated by penetrating and multiplying in other organisms, affords such convincing arguments that the following thesis is now universally accepted: These diseases are produced by living beings, that is, by beings which have all the characteristics which we consider decisive for classifying a being as alive—above all, the ability to bring forth other structures morphologically equivalent to themselves.

■ For a number of illnesses, however, unquestionably coming under the classification of infectious diseases, and no doubt issuing from a "quid," which has penetrated beings suffering from the disease, the morphological substratum of the causative agent still escapes our senses since it is too small to be seen by even the most powerful microscope. The filterability of this substratum leads us to call these ultramicroscopical viruses, filterable viruses. This filterability is determined by passing the substance through candle-shaped filters made of compressed diatomaceous earth such as potter's clay (Berkefeld candles), the pores of which are so small that they prevent the passage of ordinary microorganisms. The infectious diseases caused by filterable viruses form a special category based on the single fact that filtrates of suspensions of diseased organs prepared by passing them through the above-mentioned candles give rise to the specific infection when injected into other organisms. In this category are such human diseases as small pox and rabies; epizootic diseases of domestic animals, hog-cholera, foot-and-mouth disease, etc., and plant diseases exemplified by tobacco mosaic. In fact, the only knowledge we have about these filterable viruses, is that by inoculating the filtrates we are able to cause the same disease in healthy beings.

But on the "living" feature of the contagium, we have no proofs which might authorize us to make an unqualified statement. Nevertheless, because of a number of analogies to pathogenic microbes, the main one being the epidemic or epizootic character of these viruses, no one ever dreamed that other elements than living ones might be present. The sole positive

criterion leading us to classify the causative agents of these diseases as living beings is that the filtrates of the suspensions of the sick organs are able to reproduce the same infection. The aptitude of the filtrates to give rise to the disease by contaminating the healthy organism seems to us a sure indication of the presence of living contagium. These filtrates transfer the infection in the same manner as we are accustomed to transfer the diseases due to pathogenic microbes by injecting the cultures (broths) where the latter have multiplied.

■ Applying a method of ultracentrifugalization in use in physico-chemical research, an American scientist has succeeded in showing with indubitable evidence that this capacity of filtrates to transmit disease when they are exposed to centrifugal force is confined in a certain stratum of the centrifuged suspensions where chemical substances of ascertained size, *viz.* proteins like nucleoproteid and globulin, are found.

The results obtained with the ultracentrifuge have been verified as exact by the chemical examination of the products localized in this stratum. There is every possibility that their infecting capacity, i.e. the inherent faculty to reproduce the disease, is not due to a simple phenomenon of absorption of eventual living beings by these chemically defined compounds.

The fact that these contagious properties, which we were accustomed to consider as an exclusive faculty of living beings, belong to molecular compounds of high complexity, which still are judged as substrata deprived of the prerogative of living substances, obliges us to dislocate the borders which up to now have marked a clear separation between life and death, and to examine again our concept of that which we customarily define as life. With inert substances, or let us simply call them dead, there can be established infectious diseases, that is conditions of illness whose sources were believed to be living matter like filterable viruses. The border between life and death—has it not been actually destroyed?

■ But how in the world, one asks, can a dead substance interfere in the mechanism of vital processes so as to make them deviate from the normal? How can any dead substance, presumably incapable of multiplying itself, cause that deep disturbance of the vital processes which used to be called infectious disease? Notwithstanding the apparent paradox and the disregard of any possibility of rational explanation, the tests furnished for the first time by an American investigator, Stanley, are beyond question. The matter is also susceptible to a chemical interpretation if an attempt is made to confront the observation of Stanley and of numerous investigators who have followed in his steps and extended the research in other directions, with the processes of catalysis. To this category belong enzymes and the processes of fermentation. Autocatalysis deserves a special place in this order of facts and ideas. Since inflammation, the pathological process which accompanies all infectious diseases, in the line of the recent researches, is not more than an intensification of normal physiological processes, an interpretation on such a basis of the facts established by Stanley appears plausible.

The autocatalysis, moreover, in microbiology, is becoming more and more important, while with the discovery of the Twort-d'Herelle phenomenon, we became aware of the first-rank role it plays in the destruction of microbes, and by the research work of Friedrich Müller and Avery we were obliged to recognize in autocatalysis a stage in the recovery of pneumonia.

■ In short, the intermediate zone between life and death becomes more and more indefinite. One may say that the borders have been now violated too often for them to be maintained in the rigid limits to which the words, life and death, have heretofore been confined. We must come to an agreement or at least we must admit that there is a transition which may bridge the abyss that until now seemed to separate the quick and the dead. The drawbridge which unites them in the phenomena of autocatalysis we shall discuss in a subsequent article.

When a Veterinarian's Establishment Is a Legal Nuisance

By LEO T. PARKER, Attorney at Law
Cincinnati, Ohio

DURING the past few months the higher courts in different localities have rendered several unusually important decisions pertaining to veterinarians who have had difficulty in maintaining kennels because of noise, disagreeable odors, and the like, which were objectionable to neighbors. It is the purpose of this article to review these various cases, in order that readers may have an opportunity to know the law and, thereby, avoid expensive and troublesome law suits.

First, it is very important to realize the distinction between different kinds of nuisances. For example, a legal nuisance is one recognized as being objectionable to certain persons. In fact this term is the same legally as "nuisance *per se*." The courts will grant an injunction immediately to stop continuation of the thing or acts which comprise this kind of nuisance. On the other hand, a mere nuisance may or may not be unlawful, depending upon the particular circumstances. In fact, an ordinary nuisance may be so located or conducted that it is not objectionable to anyone, and therefore the courts will not take any action to stop it.

In other instances, the courts will not endeavor to stop a nuisance, but will order modification of the thing or acts, of which complaint has been made, to eliminate the nuisance, and incidentally disturbances and annoyances to the general public.

Acts Which Result in Nuisances

The higher courts in many states have announced exactly the kind and character of acts and things that may be pronounced to be a legal nuisance and an ordinary nuisance. In fact one higher court (90 Pac. (2d) 988) said recently that a nuisance is anything that causes unusual annoyance to persons. This same court also said that the term "nuisance" is incapable of precise definition because in no two cases are the facts identical. Therefore, in all legal controversies involving alleged nuisances resulting from the operation of an animal hospital the veterinarian may introduce testimony intended to prove to the court that not all of the neighbors object to the thing or acts of which others complain. In this manner the veterinarian may readily convince the court that, although certain persons have made complaint or filed suit, this fact is not important because others in a like situation suffer no worry or annoyance.

In another later case (188 So. 849) reported October, 1939, the higher court said that the term "nuisance" had been applied to almost all kinds of wrongs and alleged wrongs and that it always is necessary for the court to listen to details of the testimony before deciding whether the thing or act of which complaint has been made actually is a nuisance, and if so, whether it is an ordinary nuisance, or a nuisance *per se*.

Now, let us review the case of Talbot, 189 So. 469, reported in July, 1939. The facts of this case are that a veterinarian, named Stiles, has a very active practice which extends over a radius of 150 miles. Many dogs are brought to him for treatment, and he kept these dogs in kennels situated about 50 feet from his house and next door to a family residence. The occupants of this nearby home objected to the noise made by the dogs, and offered to permit the veterinarian to use without any charge a part of a lot situated a few hundred feet to the rear. However, the veterinarian failed to take advantage of this offer and continued to keep the dogs in the kennels located only a few feet from the residence next door. After waiting for a period of 18 months this neighbor filed suit against the

veterinarian and asked the court to grant an injunction against further use of the property for keeping dogs in large numbers. This neighbor testified that, perhaps because of the fact that the dogs were in strange surroundings, they barked, yelped, growled, howled, and whined, day and night.

The veterinarian testified that he did the best that he could do to keep the dogs quiet, and that when he was at home he kept the dogs relatively quiet. However, since the evidence showed that the veterinarian was away from home a large part of the time and, also, because the dogs were situated adjacent to the house in which the complaining neighbor lived, the higher court granted an injunction against further use of the kennels, in that location, for keeping dogs. This court said:

"Over the entire period of 18 months the dogs have been the source of much discomfort and disturbance. . . . We are convinced that the dogs are more noisy when he (veterinarian) is absent and he is away quite often perhaps daily including a good portion of the nights. . . . In the present case defendant's investment in kennels and accessories is not great. Their removal to a nearby site would involve a minimum of expense. A nuisance is anything which incommodes, annoys or produces inconvenience or damage. A nuisance *per se* is one which always is a nuisance in certain localities. A private nuisance is said to be one which hurts or annoys the land, tenements or hereditaments of another."

Another interesting phase of this case is that the veterinarian introduced as a witness in his favor a person who lived across the street at a considerable distance from the kennels. This person testified that the dogs did not annoy him. The purpose of this testimony was to convince the court that the dogs were not and had not been making sufficient noise to be considered as a nuisance of any kind or classification. However, it is important to know that the higher court refused to consider this testimony, and said:

"Defendant (veterinarian) introduced some testimony tending to prove that the greater part of the noise emanated from dogs owned by others. We are not convinced. . . . Several of the neighbors testified that the noise from these dogs did not disturb them. All of these, with the exception of one, lived a block or more from the kennels. The excepted one lived across the street. It is certain that unless the injunction is granted the nuisance will not abate but will probably increase in intensity as time goes on."

On the other hand, let us assume that the complaining neighbors, or other persons, live at varying distances from a dog kennel. The higher courts have repeatedly held that although one or more dogs bark and howl, and probably growl, whine and yelp, this testimony alone is not sufficient to justify allowance of an injunction to stop use of the kennel. The fact is that many courts have plainly stated that kennels are necessities. And that it also is necessary for veterinarians to have a place in which to keep dogs that are being treated. Moreover, it has been held in many instances that veterinarians need not subject themselves to undue hardships and inconvience to maintain a dog kennel, or other place for the treatment of animals of different kinds. See 79 A.L.R. 1067, in which it is stated that if a dog kennel is so situated that it will not, under ordinary circumstances, annoy ordinary persons, then it is not a nuisance and, therefore, is legal and lawful.

Also, see Kindt 30 Pa Co. Ct. R. 277, in which the court explained that a single dog or a large number of dogs may bark and make noises, and if the business is a necessity some persons must hear the noises, but if such noises are of great intensity and close to homes the courts will stop or subdue the noises. On the grounds that the complaining person lived in close proximity to the dogs the court issued an injunction, but clearly explained that not all persons who become annoyed would have a legal right to sue and have a dog kennel declared a nuisance. In this case it was explained that the testimony showed conclusively that the dogs, of which complaint was made, were so situated that all persons in the same location would normally object.

Review of Leading Cases

In order that readers may have an opportunity to determine the circumstances and conditions which may result in a court granting an injunction against further maintenance of a dog kennel, it is advisable to review all of the leading and higher court cases in which the courts actually have declared dog kennels to be legal nuisances. In this manner veterinarians may conduct this branch of their profession in a manner to avoid litigation, with the possible granting of an injunction against operating kennels.

Obviously, a kennel which is a nuisance in one instance would not be a nuisance under different circumstances and conditions. For example, in the above case (189 So. 469) the higher court refused to listen to testimony from a person who lives across the street from dog kennels. However, this does not mean that kennels are not, under any circumstances, a legal nuisance to property owners who live across the street from where the kennels are situated.

For illustration, in the leading case of Krebs, 6 Pac. (2d) 907, the records show that a veterinarian operated a kennel in which he kept 93 dogs. Many of these dogs were diseased, and they barked, yelped, and howled during the day and night. Also, a few of the dogs belonged to the veterinarian, as he frequently bought and sold dogs.

A property owner, who lived across the street, sued the veterinarian and asked the court to grant an injunction to prohibit operation of the kennel. Not only did this property owner testify as to the noise made by this large number of dogs, but many other persons, who lived across the street and even farther from the kennel, testified that the kennel was exceedingly annoying and that they could not sleep at night and were made nervous during the day.

In view of this testimony the higher court issued an injunction to prevent operation of the kennel in the selected location. However, this court stated that a dog kennel may be operated in almost any location, if arrangements be made to prevent the noise annoying persons who live in close proximity to the kennel. This court said certain kennels may be remodeled to eliminate certain portions of the noises.

And in Fuller, 114 Kans. 808, many neighbors testified that a dog kennel held 25 dogs and its operation was very disturbing and annoying. Since the kennel was located close to homes, the higher court said the operator would have to discontinue operating the kennel, or eliminate the disturbing noises.

Then again, in Heck, 22 Pa. Dist. R. 791, it was shown that a dog kennel was situated only 25 feet from a residence.

The owner of this home filed suit to have the kennel declared a nuisance. This court promptly declared the kennel to be a nuisance and granted an injunction to prevent its further operation. This Court said: "One dog if sufficiently persistent may make as much noise as a dozen dogs . . . The owner of dogs should so train them that they will not bark and yelp except in cases of burglary or fire."

City Law Held Void

There are on record many instances in which state and city laws have been held void because they were incapable of being obeyed.

For example, in the leading case of Heyman, 27 App.D.C. 563, it was shown that a city law was enacted which specified that the owners of dogs must keep them quiet so that they would not disturb persons who are ill. A person who had been sick for a long period attempted to have the law enforced, because he stated that many dogs in the town barked at night and disturbed him. However, after carefully considering the evidence the higher court held that it was impractical to enforce an ordinance of this nature, and it was held void.

While on the subject of restrictive laws, it is well to explain that certain kinds of city ordinances and state laws are void which have the purpose of limiting the operations of veterinarians. For example, any law is void which is unreasonable; or ambiguous; or contradictory to a superior law.

Take, for instance, a city ordinance which prohibits kennels in certain specified localities. A law of this nature may be valid, if it is authorized by a state law, and its purpose is reasonably to be attained without undue hardships on citizens. An illustration of an unreasonable law of this nature is one which prohibits operation of kennels by veterinarians, and does not prohibit the maintenance of kennels by all other citizens in the restricted area. In other words, all city ordinances and state laws have been declared void which are not uniform in their enforcement. Moreover, if a certain class of citizens are favored, the law is void. Valid laws must affect all citizens in similar situations exactly the same, otherwise the law is unreasonable.

Many municipalities have enacted laws which broadly prohibit keeping of dogs, and other animals, which make unusual and annoying noises. Laws of this nature have been held valid. Of course, much testimony must be given, in legal controversies of this nature, to establish the fact that actually the animal, of which complaint is made, is in the habit of making noises that are in violation of the provisions of the law.

The Right to Destroy Annoying Dogs

In the leading case of Hubbard, 90 M Mich. 221, the testimony showed clearly that certain dogs were in the habit of getting loose at night time. Also, the evidence proved that these dogs barked and made other noises while on the property of other persons. After several nights in which the property owner did not sleep and was annoyed, he shot one of the dogs.

The legal question arose as to whether or not a person who is annoyed by dogs on his own property has a legal right to shoot the offending animal.

It is interesting to observe that this court held that there are circumstances under which a property owner would be justified in shooting a dog. However, this court also held that cases of this kind are for reference to a jury, which should listen to all of the testimony and render its judgment.

Also, see Brill, 23 Wend (N.Y.) 354, in which a jury held a property owner not liable for killing a dog. The testimony in this case proved that on numerous occasions the property owner had notified the owner that his dog was running loose at night and on the private property to the great annoyance and disturbance of himself and other members of the family. The owner of the dog did not keep the dog confined; in fact, made no attempt to prevent the dog from roaming on the property whose owner had objected. One night this property owner shot and killed the dog. It is important law that this jury held the property owner justified and refused to hold him liable in damages to the owner of the dog.

Of course, certain city and state laws exist which prohibit certain acts, as shooting within corporation limits, and therefore it would be unlawful to shoot and kill a dog although he be annoying to the point where a person would otherwise have that privilege. However, a review of the higher courts fails to disclose one case where a person was justified in coming onto the property of the owner of a dog and killing the animal without permission of the owner.

* * * *

Educational Campaign Effective

More than 500,000 leaflets and booklets were distributed by the Horse and Mule Association of America this year in its educational campaign in telling how to prevent sleeping sickness in horses. This material was sent to every veterinarian, every county agent, and to every teacher of vocational agriculture in America. In addition 11,600 stallion and jack owners received the instructions, as well as more than 5,000 horse and mule dealers, over 8,000 presidents of country banks, 2,300 country newspaper editors, over 72,000 vocational agriculture students, and 54,600 farmers picked as leaders in their communities. This tremendous campaign by the Association in the first five months of 1939, and the resulting pressure put on state agricultural colleges to push similar work, was the main factor in bringing about the vaccination of over 3,000,000 horses.—*Wayne Dinsmore.*

A Year of Small Town Meat Inspection

By E. T. BAKER, Moscow, Idaho

SO MANY inquiries have drifted in regarding the installation, consecration and dedication of meat inspection in our small town of 6,000, perhaps a short summary of what has been accomplished is in order. It indicates what may be expected from the establishment of meat inspection in a town of this size and gives a basis of computation upon which to estimate results in centers of greater and less population.

During the past year a total of 4,080 animals, weighing 1,144,600 pounds, were inspected, with possibly 20,000 pounds of poultry, rabbits and a few squab. Also, some 25,000 pounds of elk and deer were looked at and 18,000 pounds of fish. In addition to this, a number of farmers brought in dressed pigs intended for their own use, and "wondered if we would look at 'em, so the wife would feel they was all right." This free service was given gladly, for we feel that when our people become "pure food conscious" it will be better for them and better for us.

Having lived in our town for 28 years, and on the same corner for over 23 years, we are not hard to find, and we are in a position to render reasonably prompt service of this kind.

Perhaps the practitioner, in his daily work, learns the value of the "human element," which cannot be controlled by any set of rules or regulations. We think this is one reason why there is so much friction in our industrial world of today, and also among nations. We could not formulate an ordinance that might prove successful in Maine or New York. We have different problems, with different view points, and, when an official, for example, sits in a big office in Washington, D. C., and inflicts an inflexible code of regulations for every part of the country, "they's a'goin' to be hell a-poppin'," as the western buckaroo would express it.

■ In the following table of monthly killings and rejections, it will be seen the amount varies from season to season, but that the amount of condemnations has been, on the whole, decreasing. This means one of two things: first, our farmers are producing healthier animals, or second, other towns without meat inspection are getting the "suspicious lookin' critters" we used to get.

Due to the fact this is a college town, our main activities open up in September, and close in June. When nearly 3,000 students and faculty members come to town for the opening of school, and nearly 1,000 grade and high school pupils enroll, our population suddenly jumps from around 6,000 to nearly 10,000. The meat markets are among the first to feel this sudden increase in business, and are all prepared for it.

On the average, our cattle dress from 450 to 700 pounds, with a few extra fancy steers weighing more. Veal run from 120 to 220 pounds, with the average around 140 pounds. Hogs dress from 130 to 600 pounds,

A Year's Slaughtering

	Cattle		Calves		Hogs		Sheep		Total		Rejected	% of Lbs.
	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	Animals	Lbs.	Lbs.	Rejected
Oct.	79	43,830	120	19,910	105	17,510	25	1,460	329	82,710	845	1.0
Nov.	74	39,170	95	17,960	126	22,720	18	1,030	313	80,880	710	0.9
Dec.	49	27,250	63	11,900	88	17,090	27	2,700	227	58,240	320	0.5
Jan.	80	43,700	87	16,500	109	22,330	33	1,790	309	84,320	780	0.9
Feb.	67	36,940	99	18,640	85	16,210	20	1,120	271	72,910	520	0.7
Mar.	91	50,150	79	18,860	170	30,080	17	1,040	357	100,130	1,030	1.0
Apr.	86	48,650	112	20,240	232	27,510	33	3,750	463	103,020	1,190	1,2
May	73	39,950	90	17,460	230	40,800	28	1,550	421	99,760	1,490	1.5
June	65	34,250	115	22,740	170	30,790	17	1,010	367	88,790	620	0.7
July	68	38,050	87	16,030	137	27,590	22	1,180	314	82,850	560	0.7
Aug.	67	38,150	71	13,020	151	25,320	6	300	295	76,790	480	0.6
Sept.	65	56,600	118	21,190	197	34,570	34	1,870	414	114,230	610	0.5
Total	864	498,290	1,136	194,450	1,800	312,610	280	17,500	4,080	1,144,600	8,690	0.8

with the average around 170 pounds, and mutton runs from 40 to 50 pounds for lambs and 60 to 140 pounds for sheep, as the university often has a bunch of large, matured sheep to dispose of.

The great majority of our cows freshen during the months of June, July and August, in preparation for the school year, hence we always have a large run of veal in September and October. Usually, our heaviest hogs are slaughtered in the spring, and a number of heavy sows that have not bred are disposed of.

Generalized tuberculosis. Only two reactors were found among some 2,000 cattle tested.

However, in November and December the meat trade drops off sharply, because of the consumption of poultry and wild game. This fall over 20,000 pounds of elk and deer and hundreds of China pheasants were killed during the hunting season, and around 10,000 extra pounds of chickens, turkeys, ducks and geese went into the Thanksgiving and Christmas trade. In March and April, large quantities of fresh fish are consumed, which cuts down on meats. The northwest is a large egg-eating section, and this also cuts down the total amount of meats consumed.

For some reason or other, we are not much of a mutton-consuming community, using, on the average, less than 1,500 pounds per month. We think this is largely due to the quality of mutton and lamb available. If sheep owners would feed their lambs properly, and the public could be furnished with delicious lamb chops and other cuts, the demand would be increased greatly. However, when a housewife orders a lamb roast, and receives a "hunk of broken-mouthed ewe," the entire family swears off lamb or mutton for some time. Our butchers endeavor to furnish the best they can, but this is not prime, to our notion. This problem is largely up to the sheep raisers.

■ Our section is almost free from tuberculosis, for only two reactors were found out of a total of nearly 2,000 head tested this summer. Some 60 Bang's disease reactors were found in over 12,000 tested. Our country is tuberculosis-accredited, and will soon be the first Bang's disease accredited county in Idaho. For that reason, our animals are fairly free from disease. Roundworms in hogs and coccidiosis in poultry are fairly common. To show what peculiar situations arise from state politics, our state game farm is located very close to an Indian tuberculosis sanitarium, where diseased children from various tribes are brought from all over the west. This sanitarium had to stop raising chickens for its own needs, but the nearby game farm turns out hundreds of China pheasants for our brave hunters. Perhaps that is one reason we are not particularly crazy about fried pheasant.

Of the 8,690 pounds of meat rejected last year, only seven carcasses were condemned. One steer fell down an embankment while being driven to town, and was badly ruptured; one cow was improperly butchered, and was "sour"; two hogs had generalized tuberculosis (these were raised not far from the Indian sanitarium mentioned above); two calves were slaughtered too young and were immature, and one sheep had generalized septicemia.

Of the parts, most of these were due to head abscesses in hogs, and spotty livers; bruises; broken bones; tumors and localized skin lesions of various kinds. During the holiday seasons, a number of poultry was condemned because of bruises, localized tuberculosis, and abscesses. In the spring, nearly a thousand pounds of fish were rejected following a sudden warm spell that melted the icing on boxes of Columbia river smelt and halibut. Most of our butchers or-

der just enough crabs and oysters for their trade, so that they do not have to dispose of many of these in the garbage barrel.

Some of our butchers have developed a good trade by cleaning the crabs and showing the customer how to "crack them." A favorite supper in our community is composed of cracked crab, potato salad, rye bread, olives, pickles, cheese and beer or ale. The sale of rabbits has largely been increased by cutting them up in "fryrpacks," ready for the skillet or oven. In this way they do not look like a skinned cat. Some of our farmers sell quite a bit of "country sausage." One rancher made and sold over two thousand pounds of sausage from his own hogs. He had four pigs! We have tried, with little success, to get our butchers to make a pure pork sausage, with two different kinds of seasonings. Our favorite mixture is made by taking eight pounds of pork trimmings from the shoulder, side meat and trimmings, then sprinkling over a scant one-half ounce of black pepper; two ounces of fine salt, and a half-teaspoonful of red pepper. Run this through coarse grinder once, and the fine grinder once. The amount of seasoning, of course, may be regulated to suit the individual taste. The other kind of sausage, that we do not care for, is made by sweeping up the back room, and then mixing a fearful and wonderful compound of salt, pepper, sage, cinnamon, etc. (Mostly etc.). Being a Pennsylvanian by birth, we know what really good sausage, scrapple, head cheese, mince meat, apple butter and all the trimmings taste like.

Another thing, we suggest to our butchers to keep their shops clean, and not have their show windows cluttered up with cans of dog food, blood covered blocks and the place reeking of rendering lard. When a woman customer goes into a bright looking shop, with a row of appetizing catsup, pickles, roasts and steaks looking her straight in the face, her mouth waters, and she may buy a dollar's worth of meat, instead of twenty cents' worth of hamburger. Most of our shops have a clean room for cutting up meat, and also for killing poultry. We insist on the back part of the shops being as clean as the front end. Dropping in on them every other day keeps the butchers on their toes. We buy meat from all of them, and they often anxiously ask us: "Well, Doc, how was that roast yesterday?" We tell them exactly what we think. This gives them a little check, and they can often sell meats for stews that would not make a first-class roast.

We think the next great advance in meat handling will come from the new violet ray lamps. We do not know anything about these as yet, except what travelling men tell us, but if they will do what is claimed for them, it will pay every shop to install them. Imagine getting away from all mould, slime, and soft meat that now must be trimmed away, and having a carcass "ripe" in three days instead of 10 to 15 days as now. Less stock will have to be carried, and much less waste will result.

■ It will thus be seen we try to keep the problems of the meat handler in mind, and to be as helpful as possible. Instead of going around like a small town constable and taking delight in condemning stuff, we try to help our butchers conserve all they can. Not long ago, a young farmer had a fine young Shorthorn heifer get bloated on alfalfa. He found her staggering around soon after turning her out of the barn so he knew she had not been sick over a half hour. He quickly figured he could not get us in time, and that "sticking" her would not do any good, so he wisely cut her throat, dragged her head down hill so she would bleed freely, and called us up. We drove out to his place, while he was dressing her, and passed her for hamburger. There was nothing the matter with the meat, but if he had waited until she was down and then killed her, we doubt if she would have passed. A few cases like this come up from time to time, and when the victim happens to be an old cow, heavy with calf, we tell the owner to make hog feed out of her. In other words in these cases, if we would be willing to eat the meat we pass her; if not, she is condemned.

In post-mortem examination of about 30 Bang's disease reactors the past year, we have found all kinds of peculiar things, such as abscesses caused by nails or wire; bruises; mummified fetuses; acute metritis, and cystic ovaries. Most of the animals were carrying normal-appearing calves. Of course, the supervising officials do not have to explain the condemnations of these apparently normal breeders to the aggrieved owners. In this respect they are more fortunate than we were in tuberculosis eradication. Meat inspection on these cases have taught us something about the "end results" of Bang's disease, and sometimes we feel we don't understand all we know about the trouble.

Pork comprises about 27% of the meat consumed in our community. The average hog dresses around 170 pounds. The heaviest hogs are slaughtered in the spring.

■ In almost every town or village, less than half of the meat consumed is federally inspected. There is always more or less local trade, and here is where the local practitioner can do his stuff. We do not advocate the local man moving heaven and earth to get municipal meat inspection established. Merely let nature take its course. If a woman's club goes after local meat inspection, it will usually come sooner or later.

The details for installing the work are given in our article in the March, 1939 issue of VETERINARY MEDICINE (pp. 143-145), and the ordinance is printed in full in the May issue (pp. 276-278).

We have received over 300 inquiries regarding these articles. We suggest that the veterinarian whose town is considering meat inspection look them up; he will find a number of his questions answered. It would be interesting to find out how many towns in the United States have meat inspection, and how many with a population over 1,000 do not have it. Perhaps the next census will give this information. This would make a good thesis for some senior in one of our veterinary colleges. At least, it would be eagerly read by the great majority of veterinarians; much more thoroughly read than a long-winded discussion on "Embolism in Bedbugs."

The Rapid Detection of Mastitic Milk By a Portable Electrometric Device[1]

By ERNEST C. McCULLOCH, Pullman, Washington
Division of Veterinary Science, Agricultural Experiment Station, State College of Washington

THE physical, chemical, and biological dissimilarities of mastitic and normal milks have long been recognized and have provided the bases for the tests used to detect milk from abnormal quarters. Inflammation of the mammary gland and the resulting degenerative changes are followed by alterations in the lacteal secretion. Increases usually occur in the number of leucocytes and hence in the catalase activity. More sediment is obtained by centrifugalization and it is of a different color. Increases also occur in the amount of lecithin and albumen present. The chlorides and the electrical conductivity increase almost in proportion to the degree of injury to the secreting cells. Clots sometimes are noted and, in most instances, the number of microorganisms, especially streptococci, is increased. Decreases usually are noted in the total amount of milk produced, in the percentage of fat, lactose, total solids-not-fat, proportion of casein nitrogen to total nitrogen, and in the curd tension. The lipase content is lowered, as is the amount of vitamin B_1 (thiamin), B_2 (nicotinic acid), and C (ascorbic acid), so that mastitic milk does not support the growth of many types of microorganisms as well as does normal milk. The hydrogen ion concentration of mastitic milk is decreased so that some samples are neutral or even slightly alkaline in reaction and thus coagulate slowly with rennet.

These deviations from the normal can be used as more or less reliable indications of udder abnormalities. There is ample evidence that competent veterinary practitioners, using any of the methods now recognized, have been able to reduce the incidence of udder infections. The results have been especially good in those herds where repeated examinations have been made and the early cases segregated.

However, most veterinarians engaged in the control of mastitis feel a definite need of improved methods for early diagnosis. The introduction of any new method for the detection of mastitis can be justified only on the basis of increased accuracy or convenience.

The Detection of Abnormal Milk by Electrometric Methods

The electrical conductivity of any solution is dependent upon the number of ions or other charged particles contained in it and upon their migration velocity. The electrical conductivity of milk appears to be primarily dependent upon the concentration of ions that result from the dissociation of the soluble milk salts.

It long has been recognized that the electrical conductivity of abnormal milk is greater than that of normal milk. Occasional attempts have been made to utilize this phenomenon in the detection of abnormal milk, but the bulky and expensive equipment in use for such determinations and the laborious technique involved has given this method little, if any, advantage over the more commonly employed methods of detecting abnormal milk.

Niemczycki and Galecki[2] found the conductivity of milk a valuable aid in the detection of streptococcic mastitis. However, they, as well as others, drew samples of milk and brought them to the laboratory. The samples then were carefully remixed to

[1] Published as scientific paper No. 441, College of Agriculture and Agricultural Experiment Station, State College of Washington.

[2] Niemczycki, Stanislas and Jules Galecki, 1938. Conductibilité électrique spécifique du lait et nouveaux dispositifs pour sa détermination. *Le Lait* XVIII, pp. 1009-1033.

redistribute the cream and were placed in a water bath to attain a constant temperature, or compensation was made for temperature variations. Conductivity readings were made by means of the standard apparatus for determining the conductivity of electrolytes. Although they concluded that the electrical conductivity may well serve to detect chronic streptococcic mastitis, there is little reason to assume that their method possessed distinct advantages over other laboratory methods.

Fig. 1. The mastitis detector is small, light, and convenient to carry.

A factor which probably has deterred the development of simplified methods for detecting mastitis by electrical conductivity is the rapid alteration of the physical composition of milk which results from the passage of a continuous electrical current through it. This causes a marked change in conductivity. Determinations made with the amounts of direct current necessary to be detected by inexpensive and rugged meters, therefore, are variable and inaccurate. Sixty-cycle alternating currents have given better results but, in the writer's laboratory, they have shown some tendency to decompose the milk.

In order to make the electrometric method applicable, the writer has developed a small, inexpensive device which can be carried readily from cow to cow, with the readings made in a minimum time and the results immediately known to the examining veterinarian. This device has been checked against other recognized tests on more than 1,000 quarter samples.

The Electrometric Mastitis Detector

The device, Figure 1, is small and light, and can be held in the left hand of the operator and dialed to the proper setting for the reading, thus leaving the right hand free for drawing the stream of milk.

As shown in Figure 2, the device employs the well-known principle of Wheatstone's bridge, the milk cell replacing one arm of the bridge. It is a recognized principle of physics that in such a bridge, in which the inductive and capacitive resistances are quite small at the frequencies used, no electrical current will flow through the shunt 6 as long as the electrical resistances remain in the proportion 1:2::3:4. Any disturbance of this ratio will result in a flow

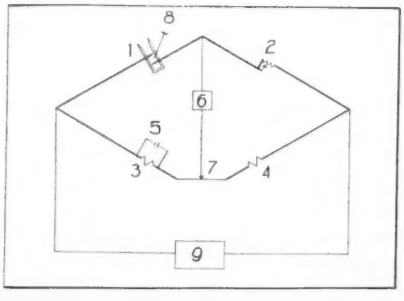


Fig. 2. Diagram of the Electrical Circuit of the Mastitis Detector. (1) Arm of bridge containing the milk cell. (2) Arm of bridge containing 200 ohm resistor. (3) Arm of bridge containing 400 ohm resistor. (4) Arm of bridge containing 200 ohm resistor. (5) Condenser. (6) Shunt through ear phone. (7) 200 ohm potentiometer. (8) Bimetallic thermometer. (9) Audio oscillator.

of electricity through the shunt 6, which in this case is through sensitive ear phones which generate a distinct hum. The tone produced is determined by the frequency of the current employed. A potentiometer at 7 allows the adjustment of the resistances 3 and 4 to match the ratio between the resistance of the milk in the cell 8 and the fixed resistance 2. By proper calibration of the dial attached to the potentiometer 7, the resistance of the milk in the cell can be ascertained when the dial of the potentiometer is turned until no hum is heard in the ear phones.

The dial can be calibrated in absolute resistance, which in this cell would be from 600 to 200 ohms; in specific conductance, which would have little meaning to the veterinary practitioner, on an absolute scale from one to 100 or from one to 160 as in the experimental models; or to correspond with the percentage of chloride in the milk most frequently associated with the reading obtained. It is probable that the latter will be incorporated in the final models.

The milk cell is constructed of rugged material which has a minimum thermal and electrical conductivity. The new transparent thermoplastic acrylic resin commercially sold as "plexiglas" or the related "lucite" serves well, although a number of products could be substituted. In the present models, the milk cell is slightly more than one-half inch in diameter, having been made with a one-half inch drill and polished to smoothness. The upper portion is enlarged and slopes outward to make it easy to draw the milk sample directly into the device. The milk cell extends sufficiently far above the top electrode to avoid foam remaining in the cell between the electrodes.

Pure nickel rods serve well as electrodes as there is little tendency for them to corrode or for milk fat to adhere to them, and nickel is a satisfactory conductor of electricity. The electrodes are separated by a distance of 4cm from the center of the upper one to the bottom of the lower one. Experimentally, the resistance of this cell has been found to be equivalent to two flat surfaces, each being 1cm square and separated by 2.81cm. It was considered desirable to construct the cell to match standard resistances rather than to construct a standard size cell which would require specially built and therefore expensive electrical equipment. Arms 2 and 4 are 200 ohm resistors, arm 3 a 400 ohm resistor and the potentiometer 7 has a resistance varying from 0 to 200 ohms. Since milk shows capacity as an electrical condenser, to balance this effect, a 0.01 mfd. condenser, 5, is located parallel to arm 3 of the bridge.

The source of current 9 consists of an audio oscillator which uses one ordinary flashlight battery as a source of "A" current and six penlight flashlight batteries as a source of "B" current. These batteries are standard for use in flashlights and may be purchased anywhere for a few cents each. The radio tube used, a "Hytron Bantam Jr.," draws approximately 0.07 amperes which is about one-fifth of the current consumption of an ordinary flashlight. The "A" battery should, therefore, last much longer than when used in a flashlight. The "B" battery consumption is practically negligible, and the penlight cells should last until they deteriorate from age.

By adjusting the dial, and hence the potentiometer 7, the bridge can be balanced when the resistance of the cell varies between 200 and 600 ohms. The relation between the setting of the dial and specific conductance in mhos is shown in Figure 3, while Figure 4 shows the relation to the resistance in ohms. Values between 5×10^{-3} and 14.25×10^{-3} mhos as minima and maxima at body temperature correspond well with those obtained by Niemczycki and Galecki,[3] who report values from 35.91×10^{-4} to 50.27×10^{-4} at 15°C. and 47.07×10^{-4} to 62.73×10^{-4} at 25°C. for mixed milk or milk from cows not known to be abnormal.

Because freshly drawn milk varies somewhat in temperature, slightly greater accuracy is obtained by the use of a quick-reading bimetallic thermometer, so placed as not to influence the flow of electricity

between the electrodes in the milk cell, and reading on a dial opposite the potentiometer dial. The position of the thermometer dial serves as a marker for the potentiometer dial, thus automatically making any necessary temperature adjustment. However, temperature correction for the comparatively slight variations found in freshly drawn milk, after the fore milk has previously been removed, is an added refinement and not essential since the temperature coefficient of the electrical conductivity of milk is approximately 0.02 per degree Centigrade and the entire scale covered by the device is from 4.75 x 10^{-3} to 14.25 x 10^{-3} mhos.

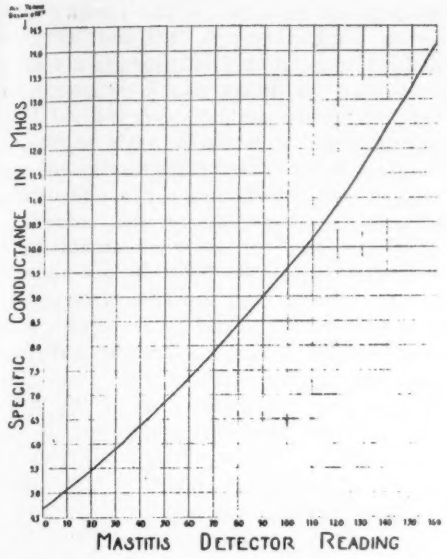


Fig. 3. The Specific Conductance in Mhos of the Mastitis Detector.

To use the device, the operator places the ear phones on his head, assumes the milking position, which is not disturbing to the cow, and turns on the operating switch. If the foremilk has not been removed just previously by an assistant or by the herdsman, the operator milks the foremilk into a bucket. A single stream is then milked into the milk cell and the device tilted so that the milk cell is higher than the dial. This allows the mercury switch to close the contact and a signal is heard almost instantly in the ear phones. The potentiometer dial is turned with the thumb of the left hand until no signal is heard. This range, in which the signal is too weak to be detected, may extend over a short distance of the dial, on either side of which the signal will be of increasing intensity. With a little practice, the exact center of the silent area can be found almost instantly. This procedure is the reverse to tuning a radio, in which the station sought can be heard weakly over a wider range of the dial but more plainly at one point; in this case the operator dials for the cessation of the signal.

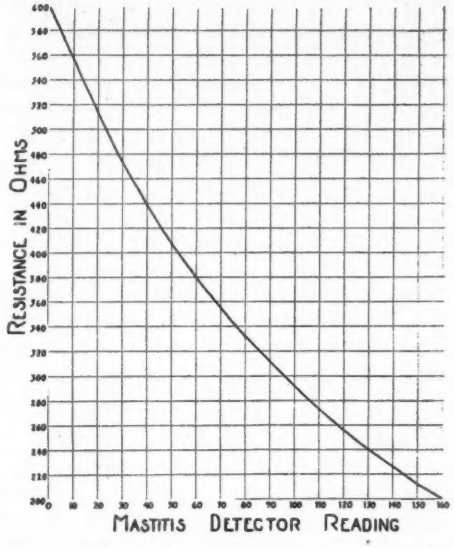


Fig. 4. The Specific Resistance in Ohms of the Mastitis Detector.

The place on the dial to which the hand of the thermometer or the marker on the device points indicates the reading for the particular sample. The device is turned over to empty the milk and is held with the milk cell slightly lower than the dial while being filled from the next quarter. While in this position, the oscillator is re-

ceiving no electricity from the batteries and the earphones are silent. Drawing the milk and making the readings require but a fraction of a minute. The writer has made quarter sample determinations on 30 cows in an hour without undue haste. Unless the previous reading has been unusually high, it is not necessary to rinse the milk cell, as not enough milk from the previous quarter will adhere to influence the reading. When rinsing is necessary, a stream of milk from the next quarter to be tested may be milked into the cell and removed by turning over the device. After a herd has been tested, the milk cell should be rinsed with water and, if it is desired, washed with a solution of a few drops of "drene" in warm water. Bacteriological sterility is not necessary.

The Accuracy of the Mastitis Detector in Detecting Affected Quarters

No test so far developed has been found to be absolutely accurate in detecting udder abnormalities and infections. This applies to the bacteriological methods as well as to those tests having chemical or physical bases. Until some criterion of abnormality has been accepted, the absolute evaluation of any method of detecting abnormal udders will remain impossible.

The present consensus accepts the determination of the chloride content of milk, by means of titration with silver nitrate solutions in the presence of potassium chromate as an indicator, as the most nearly diagnostic of any method so far developed. All readings of the mastitis detector were, therefore, checked by this method. In addition, the hydrogen ion concentration, as determined colorimetrically with brom thymol blue, and the catalase content were ascertained. As is shown in Figure 5, a reasonably close correlation exists between the chloride content as determined with silver nitrate and potassium chromate, and the readings obtained by means of the mastitis detector. The quarter sample showing the greatest discrepancy, indicated on the graph by the numeral 1, was definitely positive to the brom thymol blue test and the catalase test, thus confirming the reading obtained by the mastitis detector. The more interesting of the data relative to the individual cows is shown in Table I. It should be noted that while the conductivity and hence the reading of the mastitis detector increases with the stage of lactation, the chloride content, as determined by chemical titration, increases even more. It is possible that some of this additional chloride is not as completely ionized as is the chloride in milk during the early part of lactation and that, in addition, the greater concentration of the milk during the latter stages of lactation slightly increases the electrical resistance. Also, the slight increase in milk

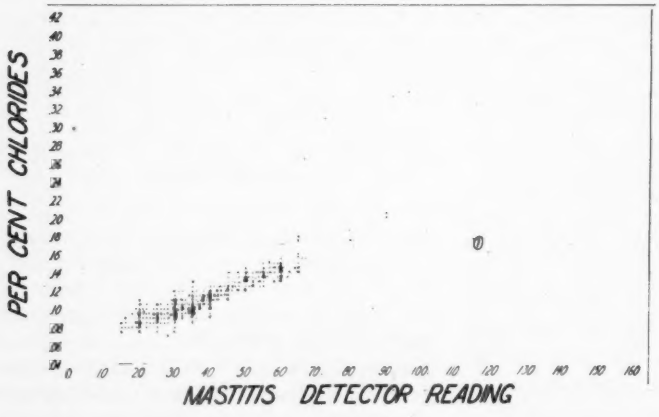


Fig. 5. The correlation between the readings obtained with the mastitis detector and the results of the estimation of the chloride content of milk by means of silver nitrate in the presence of potassium chromate.

solids other than the chlorides may tend to give falsely high chloride readings when

TABLE I

Cow	Breed	Age in Months	Days in Lactation	Mastitis Detector Reading				Chloride Content (Per Cent)			
				L.F.	R.F.	L.R.	R.R.	L.F.	R.F.	L.R.	R.R.
R12	J	45	392	75	90	25	30	0.19	0.21	0.10	0.115
C50	J	137	245	115	100	80	115	0.28	0.275	0.225	0.255
A34	J	75	401	75	85	42	65	0.215	0.24	0.14	0.185
270	H	46	463	72	65	62	62	0.17	0.185	0.145	0.155
R16	J	86	301	30	27	35	48	0.12	0.125	0.135	0.155
333	H	57	355	38	35	35	116	0.125	0.125	0.13	0.265
264	H	88	394	65	60	60	65	0.18	0.18	0.175	0.18
3N	J	51	382	130	140	40	37	0.33	0.345	0.15	0.155
A52	J	120	Calved next day	28	80	45	35	0.135	0.20	0.155	0.13
560	H	32	1	67	67	130	75	0.195	0.15	0.31	0.19
442	H	36	366	40	42	40	42	0.115	0.11	0.115	0.115
C36	J	59	277	150	100	60	90	0.36	0.245	0.16	0.22
Rockland	H	84	135	120	57	65	—	0.235	0.14	0.145	—
547	H	120	226	80	105	68	90	0.18	0.225	0.15	0.20
538	H	26	192	46	100	51	50	0.12	0.225	0.125	0.13
Mandy	H	72	125	110	55	55	58	0.28	0.135	0.135	0.13
204	H	120	31	120	—	55	—	0.305	—	0.14	—
Villa	J	86	90	20	20	20	50	0.105	0.095	0.10	0.145

the silver nitrate-potassium chromate method of chloride estimation is used. Careful comparison of Fig. 5 and Table I will show that those quarter samples showing comparatively high chloride content and yet relatively low electrical conductivity are from cows in advanced stages of lactation, as is shown by seven of the first eight cows in Table I, or very near parturition as are cows A52 and 560. As is shown by cow 442, an advanced stage of lactation does not always result in high chloride content in comparison with the electrical conductivity. This cow, however, is not with calf, which may account for the absence of the change in the electrical conductivity-titrable chloride content ratio which is characteristic of the later stages of lactation. The data now available indicate the electrical conductivity method, using the mastitis detector, to be somewhat more accurate in detecting abnormal quarters than is the estimation of the chloride content of the milk, by chemical titration with silver nitrate in the presence of potassium chromate.

The Role of the Veterinary Practitioner

Emphasis should be placed upon the value of the electrometric titration of milk by means of the device herein described, only as a rapid, convenient and relatively accurate aid to the trained practitioner of veterinary medicine in the detection of udders giving abnormal milk. The data now available indicate the results obtained by this method to be more reliable in the detection of udder abnormalities than is the chemical titration of the milk with silver nitrate solutions for the determination of the chloride content. The data indicate a close parallel between the results obtained by these two methods and the consensus, as expressed in the literature, accepts the chemical titration of milk for the chloride content as the most nearly reliable method now in use for the detection of abnormal milk.

The great advantage of the device herein described is that the results are immediately known to the examining veterinarian while he is seated at the cow, instead of being ascertained at a later time when he is away from the farm and the cow and the complete history no longer is readily available. The drawing and labeling of milk samples are eliminated, as is the necessity of standardized chemical solutions.

Final diagnosis must not be based upon the results of the device alone any more than final diagnosis should be based upon any chemical, physical or biological method now available. Knowing the results given by the device, the veterinarian can consider the history, placing special emphasis upon the time the cow has been in lactation, since it definitely is known that milk from normal quarters will give positive results

with most of the indirect tests for mastitis at the start and near the end of the lactation period. While seated at the cow, the veterinarian is in a position to make a thorough physical examination of every quarter which produces milk giving high readings, and, if desired, to draw milk for other recognized tests.

At this time, the veterinarian is in a position to suggest isolation and other sanitary measures and to supervise the herdsman in carrying them out. This, together with the rapidity with which tests can be made, which allows more frequent examination of the cows without undue financial burden upon the owner, should contribute markedly to the control of udder disorders. Neither the device herein described nor any other test now known can make the diagnosis of the udder abnormalities a lay procedure.

With the hope that the control of this method can be maintained in ethical hands and prevented from being used as a means of exploitation, a patent has been applied for to cover this device. The patent rights have been assigned to the Research Foundation of the State College of Washington.

Summary

A device which makes possible the rapid and relatively accurate determination of the electrical conductivity of milk has been described.

The electrical conductivity has been found to be a good indicator of milk from abnormal quarters. Early cases of mastitis can be detected with a degree of accuracy comparable to that of the more time-consuming and complicated chemical or biological tests now in use. Radio ear phones are worn by the operator, who milks a stream into the machine which then is dialed to indicate the degree of electrical conductivity. The test can be made very rapidly, and, since the result is known immediately, opportunity is given the veterinarian to make a physical examination or to collect samples for confirmatory tests and to supervise such sanitary measures as he may deem necessary.

Insemination of Dairy Cows

The best time for service or artificial insemination of dairy cattle is late in the heat period or very soon after the close of heat, according to evidence uncovered in a study of 35 heifers by G. M. Werner, L. E. Casida and I. W. Rupel.

This investigation consisted of observing the animals for signs of heat morning and afternoon, and examining them to learn how closely ovulation coincided with heat or followed it. The essential problem is to inseminate animals shortly before or at the time of ovulation, since conception is then most apt to occur.

All the 15 heifers examined during heat showed a follicle, but none of them had a follicle present as late as two days after heat, indicating that ovulation took place within those limits in all the animals.

Of these 15 heifers, two ovulated during the first half-day following heat, seven during the second half-day, and six during the third half-day.

Another investigation designed to get more precise evidence on these matters has now been started by A. Nalbandov and Casida. Cows are checked for heat with a bull twice daily, and an animal found in heat is checked again at two-hour intervals. In this way it is possible to determine when a cow goes out of heat with an error of not more than two hours.

Likewise, a cow's ovaries are examined when she is in heat, to note the position of the follicle. After the heat period is over, an examination is made every two hours to learn whether the follicle has ruptured—that is, whether ovulation has occurred.

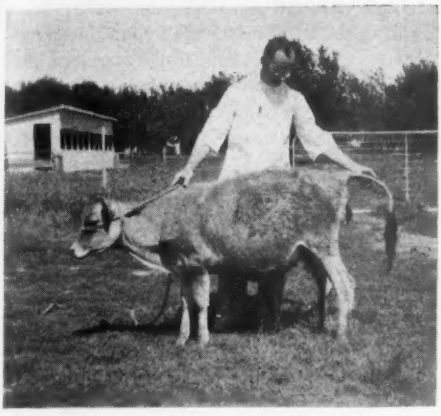
Findings thus far obtained in this very careful manner bear out those secured in the field study. The time from the end of heat until ovulation has varied from 2¼ to 22¾ hours, the average of 15 such intervals being 11½ hours.

Both these studies indicate heat begins more often in the forenoon than in the afternoon, and the investigation of Nalbandov and Casida showed that ovulation took place between 4:00 and 10:30 a. m. in 11 out of 17 cases.—*Wisc. Exp. Sta. Bull.* 446.

Dystocia in a Thirteen-month-old Heifer

On the morning of June 2, 1939, a client brought a 13-month-old Jersey heifer to T. P. Crispell's veterinary hospital in Parsons, Kansas.

History.—The owner had noticed signs of approaching parturition in this heifer



while doing his morning chores. A call was made to the farm and a manual examination of the heifer was made. The calf was in breech presentation and apparently had been dead for some time, for the tissues were emphysematous and the hair was easily removed from the hide. The owner was advised to bring the animal to the hospital for a cesarean section, as that was the only chance to save the heifer.

Treatment.—An ounce of chloral hydrate in a gallon of water was given the animal through a stomach tube and this produced complete narcosis in about 20 minutes. An area on the right side of the linea alba and anterior to the udder was shaved and disinfected. The technique was that devised by Richard Götze, consisting of an incision through the right abdominal side halfway between the median line and the right subcutaneous abdominal vein just in front of the udder. In this operation the incision is made parallel to the median line down to the peritoneum; the incision through the peritoneum is perpendicular to the skin incision.

The incision in the uterus was closed with a double row of continuous Lembert sutures; the peritoneum and transverse muscle were sutured in one line; the internal and external muscles were sutured separately, and the skin incision was closed with a mattress suture.

The heifer measured 34 inches tall and 36 inches from the point of the withers to the sacro-coccygeal articulation. The calf measured 26 inches tall, nine inches wide over the lumbar region, and 38 inches from the frontal eminence of the sacro-coccygeal junction.

The heifer was under anesthesia for about two and one-half hours. After the operation she was covered with blankets to help regain and hold normal temperature, but died about 12 hours after the operation.

C. H. KENNEDY, K.S.C. '40.

Manhattan, Kans.

Tracheal Choke

Recently I received a call from a very perturbed farmer who complained that his cow was "wheezing" and "off feed." The animal's eyes were swollen almost shut; respirations were asthmatic, heart beat 90, temperature normal.

The owner had made no change in the feeding program or in the immediate environment. What was the cause of this condition?—*A. C. N.*

Comment.—Such cases, which are more or less rare, are usually laryngeal or tracheal choke. Some foreign object is inhaled, and sets up sufficient irritation to cause a constriction (tonic spasm) of the laryngeal muscles, which causes wheezing sounds in breathing, as in asthma.

A mule which I attended last summer had developed such tonic spasms of the larynx that it nearly died before a trachea tube could be passed. The passing of the tube gave almost immediate relief; the next afternoon the condition had disappeared and the tube was removed. No other treatment was necessary; mucus accumulated in the air passage and dislodged the object, which was coughed up and swallowed.

If a trachea tube is used, the wound should, of course, be treated.—*S. L. S.*

The Examination of Milk for Streptococci of Infection of Bovine Mammary Tissue [1]

INVESTIGATORS[2] agree that members of the streptococcus group of bacteria are the most common cause of infectious mastitis, and that *Streptococcus agalactiae* is responsible for approximately 95% of all streptococcic mastitis.

The workers [3,4,5,6,7] concerned with the control and eradication of mastitis have shown that herds may be established and maintained free of streptococcic mastitis and that a preclinical diagnosis is essential to the control of the disease within a herd. In these studies cultural methods were applied to the milk to demonstrate the freedom from or presence of streptococci of mastitis. The assumption is made that if streptococci were present in the udder tissue they would at some time be found in the milk.

In contrast Hucker[8] reports "A study of 24 udders aseptically removed and cultured from cows known to be free of mastitis and to have passed through one or more lactation periods, shows that all contained mastitis streptococci . . . a similar study of 21 udders removed from virgin heifers and calves indicated that less than half contained mastitis streptococci in the mammary tissue." Miller[9] reported a study of the colostrum of 100 first-calf heifers, with streptococci found in the first colostrum in one or more quarters of 27 animals. In this same paper he states, "The hypothesis has been stated that heifer calves may become infected through sucking each other after drinking milk infected with mastitis streptococci. The infection thus acquired remains latent until the udder begins to function." This view is borne out by the results of our studies. In addition, injuries of the udder and teats of calves predispose to infectious mastitis if the mastitis streptococci are present in the herd.

This study was undertaken to determine the efficiency of diagnosing streptococcus infection of the udder by examining the milk for mastitis streptococci, and to determine whether all cows harbor mastitis streptococci in their udders.

Procedure

Ninety-four dairy cows were checked ante mortem for streptococcic mastitis by properly collecting milk samples for microscopic test[10]. A physical examination of the milk was made at the time of collecting the samples. Post-mortem examinations were made of each udder, immediately following slaughter, and a portion of mammary tissue from each quarter of each udder was placed into a sterile container and transported to the laboratory for culture on tryptose blood agar (containing 1-150,000 final dilution of gentian violet).

The surface of the mammary tissue was seared by holding in the naked flame. The piece of seared tissue was then cut with a pair of sterile scissors. The newly-cut surface was streaked over the surface of the blood agar. These inoculated plates were incubated at 37° C. and checked for growth of organisms.

A portion of the right and of the left supra-mammary lymph nodes was cultured

---

[1] Journal article No. 405 N.S. from the Michigan Agricultural Experiment Station.

[2] Now in Department of Surgery and Medicine, Kansas State College, Manhattan, Kansas.

[3] Munch-Peterson, E., 1938. Bovine mastitis. Imp. Bureau of An. Health Review series No. 1.

[4] Bryan, C. S. and G. J. Turney, 1936. A sequel to a public health ruling concerning streptococcic mastitis. *Amer. Jour. Pub. Health,* 26:5, pp. 517-520.

[5] Minett, F. C. et al., 1933. The control of chronic streptococcic mastitis. *Jour. Comp. Path. and Ther.,* 46, pp. 131-136.

[6] Plastridge, W. N. and E. O. Anderson, 1936. Detection of shedders of streptococci responsible for infectious bovine mastitis. *Amer. Jour. Pub. Health,* 26:7, pp. 711-715.

[7] Plastridge, W. N. et al., 1934. Infectious bovine mastitis: 3. Methods of control. Storrs Agr. Exp. Sta. Bul. 197.

[8] Hucker, G. J., 1937. The presence of mastitis streptococci in bovine mammary tissue. N. Y. Agr. Exp. Sta. Tech. Bul. 241.

[9] Miller, W. T., 1936. The incidence of types of streptococci in first calf heifers at parturition. *Cornell Vet.,* 26:3, pp. 241-249.

[10] Bryan, C. S., 1935. The microscopic diagnosis of infectious mastitis. *Vet. Med.,* 30:10, 149-156.

Mastitis as an Indicator of the Streptococcus

By C. S. BRYAN and G. R. MOORE[2]
Michigan Agricultural Experiment Station, East Lansing, Michigan
and
J. H. CAMPBELL
City Health Department, Lansing, Michigan

from 61 of the cows. In each case when the mastitis streptococci were found in the udder tissue they were recovered from the lymph nodes, and when absent from the udder tissue none were isolated from the lymph nodes. On this account the supramammary lymph nodes of the last 33 animals were not cultured.

Six of the non-infected cows were from herds being used in a cooperative study of the prevention and control of mastitis. Routine monthly mastitis tests were made during the life of each of these six cows; at no time were mastitis streptococci found in their milk.

Results and Discussion

The results of cultural examination for streptococci of mastitis of samples of mammary tissue and milk from each quarter of 94 cows are presented in Table I, where as shown streptococci were isolated from both the milk and udder tissue of 67 of the 94 cows. Infection was present in one quarter of six cows, in two quarters of 17 cows, in three quarters of eight cows, and in all four quarters of 36 cows. The mastitis streptococci were found in the milk from each quarter which on culture yielded the organisms after slaughter and when no streptococci were found in the milk none were present in the udder tissue. This is demonstrated by the fact that in 27 cows streptococci were not found either in the milk prior to slaughter or in the udder tissue after slaughter.

TABLE I.—The Status of Mastitis Infection upon Examination of Udder Tissue and Milk of 94 Cows

Status of udder and milk	Number of cows	Number of quarters per cow infected with streptococci 1	2	3	4
Strep. infected	67	6	17	8	36
Not infected	27	0	0	0	0

The milk of some of the infected cows was abnormal on physical examination (strip cup) at the time samples were collected prior to slaughter. These data are presented in Table II, in which it is shown that 20 of the 67 streptococcus-infected cows gave a clotted milk. This is, no doubt, the reason why most of these cows were eliminated from the dairy herds for slaughter. Under ordinary field conditions the number of infected cows giving a gargety milk at any one examination is not nearly as high. The number of quarters per cow infected with streptococci did not determine the physical character of milk secreted; for one of the six, or 16%, of the cows infected with streptococci in one quarter gave a gargety milk while five of the 17, or 29%, infected in two quarters, and three of the eight, or 37%, infected in three quarters and 11 of the 36, or 30%, of those infected in four quarters gave a gargety milk.

TABLE II.—The Relation of Clotted Milk to the Number of Quarters Per Cow Infected with Mastitis Streptococci

Status of udder and milk	Number of cows	Number of quarters per cow infected with streptococci 1	2	3	4
Strep. infected	67	6	17	8	36
Garget	20	1	5	3	11
No garget	47	5	12	5	25

Six of the 94 cows tested were heifers that had never lactated. A small amount of secretion was obtained from each quarter prior to slaughter. The secretion was of a viscous, serum-like character. Portions of the mammary tissue were collected immediately after slaughter. The results of examination of this secretion and the mammary tissue showed two of these six heifers to be infected with mastitis streptococci. The infection was present in one quarter of one heifer and in two quarters in the other heifer. In both instances the

streptococci were recovered from both the mammary secretion and the mammary tissue. The mammary tissue and secretion from the remaining four heifers contained no streptococcic infection. These data confirm the opinion of Miller[9], that heifers may acquire the infection, which remains latent until the udder begins to function, but that the majority of first-calf heifers are not infected at the beginning of their first lactation period.

Six of the 27 non-infected cows of this study were eliminated from two dairy herds because of poor type and low milk production. Mastitis streptococci were never found in their milk on monthly tests during the life of each cow. (They were examined at monthly intervals for 6, 17, 6, 24, 36 and 20 months, respectively.) In each of these six cows the udder tissue at the time of slaughter was found to contain no streptococci. These data, in conjunction with those of Table I, indicate that if streptococci have invaded the mammary tissue they will be found in the milk, and if no streptococci are found in the milk it is evidence that streptococci are not present in the udder.

Summary

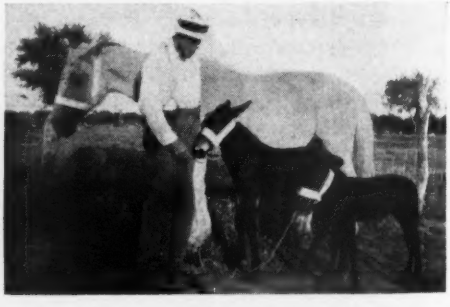
Sixty-seven of 94 cows were found to have streptococci in the milk prior to slaughter and the mastitis streptococci were found in the udder tissue collected immediately after slaughter. The presence of streptococci in properly collected milk samples was evidence that there was a streptococcic infection of the udder tissue.

In 27 of the 94 cows, streptococci were not found in the milk prior to slaughter and the streptococci were not found in the udder tissue. Six of these cows were free of streptococcic mastitis on monthly tests for periods varying from six to 36 months prior to slaughter. The absence of streptococci in properly collected milk samples was evidence that streptococcic infection was not present in the udder tissue.

Two of six heifers that had never lactated were found to be infected with streptococci of mastitis. The remaining four yielded no streptococci upon examination of the mammary secretion or tissue.

Measures Against Calf Pneumonia

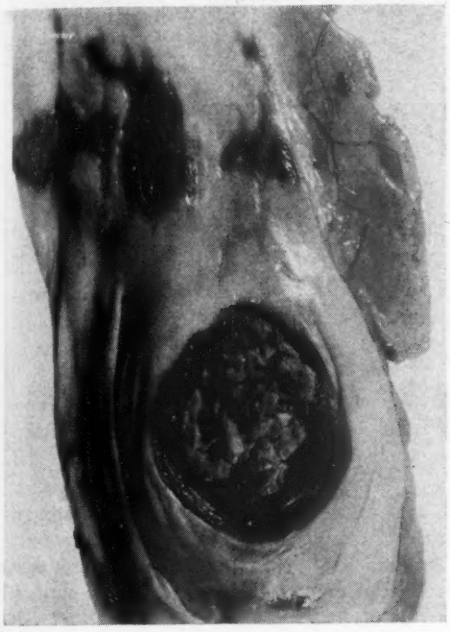
Calf pneumonia can be curbed to a certain extent by breaking the calves into small groups as soon as the disease makes its appearance, leaving all abnormal calves in the infected quarters. Newborn calves are raised in small groups in noninfected quarters. The use of whole blood from normal adult cows or hemorrhagic septicemia serum may be indicated. Other measures to adopt are artificial heat, blankets over the chest, expectorants, and other routine treatment plus the use of sulfanilamide or neoprontosil. Up until two years ago our mortality in calf pneumonia was approximately 50%. During the last two years, the mortality has dropped to 25%, the only difference in treatment being the use of sulfanilamide. We give calves 150gr twice daily. During the last few months the use of a new drug, sulfapyridine, has proved almost miraculous in the treatment of calf pnuemonia. Given early in the disease in 5gm doses, twice daily, improvement is usually evident in from 24 to 48 hours. If the therapeutic value of sulfapyridine proves to be as good as present results indicate, it will prove a valuable asset in saving many calves. Of course, the true test of this drug will be its use during the severe winter months.—*W. J. Gibbons,* in the *Cor. Vet.*, 30:1.



These twin mare mules were foaled July 23, 1939, by a mare approximately 23 years old, owned by Isaac Carl of Labett, Kansas. The picture was taken when they were one month old. The larger mule was 32 inches tall at birth, and had the strength of a normal mule foal; the little one was only 23 inches tall at birth, and was unable to stand on her feet, but with good care was soon strong enough to stand and nurse.—C. H. Kennedy, K. S. C. '40.

Esophageal Ulceration in a Cow

History. — A five-year-old pure-bred Guernsey cow was presented at the veterinary clinic of Kansas State College with a history of having been off feed for several days, and having vomited several times.



An ulcer was present in the esophagus.

She had recovered from a similar attack about a month previously. Alfalfa hay had been fed prior to the last attack.

Symptoms. — When presented at the clinic, this cow was acutely bloated, was coughing, and the conjunctiva was slightly anemic. The temperature was 103.2F° The stomach tube could not be passed beyond the lower third of the esophagus. Rectal examination revealed distention of the rumen and intestines.

Diagnosis.—Obstruction of the esophagus and impaction of the rumen.

Treatment.—An attempt to remove the obstruction in the esophagus by pumping in water through a stomach tube and siphoning it out was unsuccessful, so a rumenotomy was performed. The rumen and reticulum were packed with dry food material. After the reticulum was emptied the food material in the esophagus was pushed out by the use of the stomach tube. The cow appeared to improve after the operation and was discharged from the hospital three days later. Three days after being discharged the cow was returned with a recurrence of the esophageal obstruction. This time the obstruction was pushed on into the rumen by the stomach tube. The cow would not eat or drink so five gallons of water were administered daily through the stomach tube. Thirteen days later after its first appearance at the clinic the cow was destroyed.

Autopsy.—A circular ulcer two and one-half inches in diameter (see illustration), was present in the lower third of the esophagus eight inches from the cardia. The surface of the ulcer contained a cheesy material, under which was a raw, red surface. Several small reddened areas were present near the ulcer. The esophagus was dilated in this region. Subacute fibrinous gastroenteritis was present in the abomasum and small intestines.

FRANK GILLETT, K.S.C. '40.
Manhattan, Kans.

Sweet Clover Poisoning

In an investigation of sweet clover disease on a farm in Marquette County, Wisconsin, Campbell, Overman and Link of the University found that five head of young cattle had already died and others were in a dangerous condition from eating sweet clover which had been too wet when placed in the barn, and consequently, was damaged. Tests showed that the blood of a dead heifer had completely lost its clotting power. Blood from the herd sire retained less than 10% of normal clotting power and the blood of another heifer, also affected, showed only 40% of normal clotting power. The blood of a horse that had fed upon the same hay, was normal. Overman and associates have not as yet isolated or identified the poisonous principle chemically, but they have concentrated it until it is 10,000 times as deadly as the original hay.

Trichomoniasis

In The Utah Experiment Station Dairy Herd [1]

By D. E. MADSEN and RUE JENSEN[2]
Utah Agricultural Experiment Station,
Logan, Utah

SINCE the report by Emmerson[3] venereal trichomoniasis of the bovine species has been reported from many sections of the United States. Following the report by Hammond and Jensen,[4] the organism has been identified in various other herds in Utah. The history of these herds suggested that the economic loss to the dairymen resulting from this infection is an important consideration. The present report deals with this infection in one herd in which observations were made and compiled with the object of determining the approximate extent of the loss and learning more about the nature of the disease and its detection.

Herd History

The Utah Agricultural Experiment Station herd, which comprises 30 milking cows and about that number of heifers, was for several years affected with Bangs' disease, which was finally eradicated in 1930. During the period January, 1932, to October, 1939 (approximately eight years), considerable difficulty has been encountered in establishing pregnancy in heifers and to some extent in cows. Although no trichomonads were found in animals from this herd until 1936, the breeding history suggests that this infection may have been present before that time.

Prior to October, 1938, no systematic search for *Trichomonas foetus* was made in the animals comprising this herd. The parasite had been found in several animals which had exhibited breeding difficulties, but not all animals had been examined. The organism could not be consistently demonstrated when repeated examinations of a given animal were made. Furthermore, the percentage of positive findings in animals exhibiting breeding difficulties was low. During 1936, 34 cows exhibiting breeding troubles were examined and only six were found to harbor the parasite. Of 57 examinations of these cows only nine were found positive for trichomonads.

Object of Study

The irregular microscopical findings suggested that either the organism disappeared from the vaginal exudate or the diagnostic method was not adequate.

As opportunity was not provided for reinfection this could not explain some of the irregular findings when examinations were repeated many times on the same animal. Realizing the importance of the above factors in connection with any control measure, a study was made with two main objectives: (1) to introduce, if possible, a more accurate method of diagnosis and thereby determine the exact herd incidence; (2) to determine the course, symptoms and source of herd infection through the study of individual cases.

Procedure

Prior to this study the diagnostic method consisted of direct examination without culture. Mucus and morbid fluid were collected from the anterior vaginal region by introducing a cotton swab saturated with an isotonic solution and attached to a metal applicator. By pressing the swab between two slides, fluid was obtained for direct microscopic study. Since this method did not yield consistent results, the culture method, as recommended by Andrews *et*

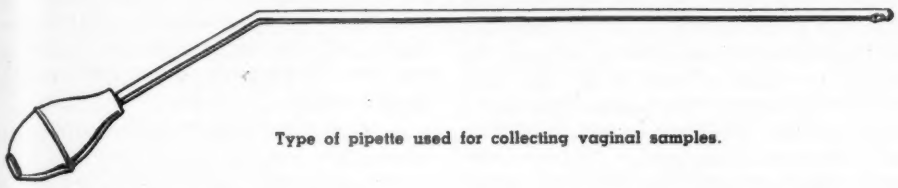
[1] Contribution from the Department of Animal Pathology, Utah Agricultural Experiment Station. A portion of this study was made in connection with a master's degree thesis by the junior author.

[2] Research professor and research assistant, respectively.

[3] Emmerson, M. A., 1932. Trichomoniasis in cattle, a preliminary report. *J. A. V. M. A.*, 81:5, pp. 636-640.

[4] Hammond, Datus M. and Rue Jensen, 1938. Incidence of *Trichomonas foetus* Riedmuller in Utah cattle. Utah Academy of Sciences Arts and Letters. Proc., 15, pp. 133-134.

al,[5] was used in the study here reported. By this method washings were obtained from the anterior vaginal region by introducing a liquid culture medium with the aid of a pipette. The pipette consisted of glass tubing ⅜ inch in diameter and 30 inches long. One end was sealed and a lateral aperture blown about ¼ inch from the seal. The other end was provided with a 50cc rubber bulb. Four inches from the bulb the tube was bent to form an inner angle of about 135°, with the angle and the lateral aperture on the same side of the tube. The pipette could thus be turned, depending on whether liquid was being introduced or being retrieved from the vaginal floor. Sufficient pipettes were used so that a sterile instrument was available for each cow.



Type of pipette used for collecting vaginal samples.

The culture medium used was Ringer's egg blood medium. It was prepared by mixing thoroughly four whole eggs with 50cc of Ringer's solution. After apportioning the mixture to test tubes in 1cc amounts it was slanted and heated in the autoclave at 15 pounds pressure for 30 minutes. About 15cc of sterile Ringer's solution, pH 7.4, containing 0.2% dextrose and 0.5% defibrinated cow's blood, were added to each of the tubes, filling them to capacity. On examination of the cow the fluid portion of the medium was drawn into the pipette and used for the cervical and vaginal washing. After retrieving the culture fluid the sample was incubated at 37° C. for 36 to 48 hours, following which a drop of medium extracted from the bottom of the tube was examined microscopically for motile trichomonads.

[5] Andrews, Justin, Kathel D. Kerr and Dale A. Porter, 1935. Cultural and microscopic diagnosis of *Trichomonas foetus* infection in cattle. *Jour. of Parasitol.*, 21:6, p. 452.

Incidence of Infection in Herd

A series of 10 weekly examinations was made of each member of the herd of 30 animals, beginning October 25, 1938.

Having determined from these examinations that animals H 88, H 310, and H 329 were cases of infection, it was noticed that all these cows became positive to examination shortly after service to bull H 145. Consequently all animals bred to that bull following the series of 10 weekly examinations were carefully checked by means of cultures for development of the disease. Additional infections in cows H 300, H 326, H 323 and H 331 were thus located. From October, 1938, until March, 1939 (five months), 10 cows were bred to bull H 145. Of these, seven subsequently were found to be infected. Examinations following breeding were made at daily intervals for a time and later at three- to four-day intervals and weekly intervals. These examinations were continued for six to 10 months.

Case Studies

Case H 88.—This animal was bred to bull H 145 on November 10, 1938. After an incubation period of nine days trichomonads were first found. Results of frequent diagnoses were positive through a period of 19 days, after which the organism could no longer be found. Throughout this period of positive diagnoses a positive correlation existed between the total number of parasites in examined samples and their degree of motility. If implantation resulted from the breeding of November 10, 1938, the embryo was destroyed by parasitism and aborted unobserved. The next estrum occurred January 10, 1939, without breeding. It recurred normally February 1, 1939, and the cow was rebred to bull H 145, and again on

February 21 and March 15. The last breeding resulted in pregnancy.

Symptoms of infection were not distinct. The internal vulvar and vestibular membranes were inflamed and rubicund. The vagina contained an abnormally large quantity of mucus which at the beginning of the positive period was translucent but contained flakes of pus. After about the second day of the same period the mucus was replaced by a mucopurulent exudate. Examination disclosed that this was probably being discharged from the cervix. This morbid material was occasionally discharged externally from the genital tract. After disappearance of the parasites the mucus returned to normal. Examination disclosed slight petechiae of the vaginal mucosa.

Case H 326.—This animal was bred December 28, 1938, to bull H 145. The course, symptoms and sequelae of infection were similar to those of animal H 88. After the parasites and symptoms disappeared, a single breeding on February 5, 1939, resulted in pregnancy.

Case H 300.—This animal was bred November 28, 1938, to bull H 145. Trichomonads were first observed 10 days later and were demonstrable for 11 days, after which they disappeared from the vaginal tract. To this point the infection was identical to those of animals H 88 and H 326. But from here on it differed. Results of daily examinations remained negative for 30 days, after which they became positive for a period of 31 days, at the end of which time treatment was applied in the form of enucleation of the corpus luteum and uterine irrigation with 0.1% aqueous solution of potassium orthoxyquinoline sulphonate. A definite pyometra was found at the time of treatment. Within four days the uterus had returned to approximately normal and the estrual cycle soon became established for the first time since the infection was discovered. Mating on April 29, 1939, was followed by another on June 28, 1939, which resulted in pregnancy.

Case H 329.—This animal was bred October 26, 1938, to bull H 145. Forty-four days later pyometra developed and the results of examinations were positive for a period of 71 days. At the end of this period the corpus luteum was enucleated and estrum was established for the first time in 67 days. Following corpus luteum removal no parasites were demonstrated until September 5, 1939, the date of the last examination. One breeding on May 8, 1939, resulted in pregnancy.

It is probable that this animal became temporarily positive shortly after the October breeding, but escaped notice because of inexperience of the diagnostician. Granting this probability, the course, symptoms and sequelae of infection were identical to those of animal H 300.

Case H 310.—August 26, 1938, this animal aborted a fetus sired by bull H 145, the abortion being due to trichomoniasis. The animal was rebred to the same bull on November 21, 1938. Four days later the parasite was demonstrated but at no subsequent examination was the diagnosis positive. Normal conception resulted from this breeding, parturition occurring on August 29, 1939. A degree of resistance may have resulted from the earlier infection.

Cases H 319 and A 82.—Both of these animals were bred to bull H 145 during December, 1938. Daily examinations made of H 319 following breeding failed to disclose trichomonads. Neither could the parasites be demonstrated in the uterus and vagina on January 20, 1939, when this animal was slaughtered because of a positive tuberculin reaction.

Animal A 82 aborted a fetus in July, 1938, as a result of trichomoniasis. A degree of resistance may have resulted from this infection, inasmuch as daily or weekly examinations from December, 1938, to September, 1939, failed at any time to disclose the parasite. Matings occurred in December, 1938, and in January and February, 1939; the latter resulting in pregnancy.

Case H 331.—This animal was bred to bull H 145 on January 27, 1939. Trichomonads were first demonstrated 18 days later and the animal remained positive for 13 days, after which examinations were discontin-

ued for 58 days (until April 27, 1939). At this time examinations were conducted at about weekly intervals until September, 1939, all examinations being negative. One breeding made on March 15, 1939, resulted in pregnancy.

Case H 323.—This animal was bred to bull H 145 on January 25, 1939. Trichomonads were first demonstrated 18 days later and examinations remained positive for 11 days. One negative examination was made on the 14th day of infection after which examinations were discontinued for 58 days (until April 27, 1939). Examinations on the above date were negative, as well as three examinations made during early May. Examinations on May 13, 17 and 20 were positive and approximately weekly examinations from that time until September 5, have not shown any parasites. No heat periods occurred following the service in January and the animal was assumed to be pregnant until examination nine months after service revealed the cervix sealed and the uterus distended with morbid fluid.

Case E 49.—This animal was bred to bull H 145, February 14, 1939. All examinations until September 5, 1939, were negative. If infection resulted from breeding, its course was unlike that in the other infected animals. Pregnancy was established following a second breeding on April 21, 1939.

Case H 145 (bull).—Several examinations were made of this bull by direct microscopic technique as well as by cultures prepared from washings of the sheath and from samples of semen. Although data indicate this bull was infected, all examinations were negative for parasites. A fetus sired by this bull was aborted May 25, 1937, as a result of trichomoniasis. It, therefore, appears that the bull infection was acquired some time prior to the recent wave of infections. Presumably the infection was of a chronic nature and the trichomonads harbored by him were insufficient to recover by culture methods. The fact that seven of the 10 cows served by him during the period of study (October, 1938, to February, 1939) became infected, strongly indicts him as the source of such infection.

Since bull H 169 infected six animals in 1936, it is likely that this was the source of infection for bull H 145.

January 15, 1939, when it was evident that bull H 145 was the source of infection, he was treated by introducing 0.1% aqueous solution of potassium orthoxyquinoline sulphonate directly into the urethra as well as the preputial cavity. Subsequently four cows were bred to test the efficacy of the treatment. Two of them developed the infection. February 17, 1939, the treatment was repeated. From that date until September 5, 1939, eight cows have been served by this bull and examinations have not disclosed any transfer of infection.

Discussion

Records of daily examinations of cows infected with trichomonads show that occasional negative diagnoses were made during the period when most diagnoses were positive. This may have been due to faulty technique. Usually these negative diagnoses were made when the mucus was temporarily clear and apparently normal, presumably during a recession of discharge of trichomonads from the uterine reservoir.

Several examinations were made of the entire herd with a speculum and light to determine the condition of the genital tract of parasitized cows as compared with that of non-parasitized cows. The only consistent differences observed were severe inflammation of the vestibular membranes and a few petechiae on the vaginal mucosa, which were present only in cows infected with trichomonads. Petechiae may have resulted from mechanical injury to the mucosa by the apparatus used. It is supposed that the trichomoniasis rendered the mucosa traumatic. Inasmuch as other infections may cause a similar vulnerability of the mucosa, these petechiae should probably not be termed pathognomonic of trichomoniasis.

Granulation or exanthema of the vestibular membranes was considered by early investigators of bovine trichomoniasis to be a symptom of this disease. This is characterized by eruptions which vary in number and in size from tiny vesicular eruptions to papulae 2mm in diameter and 1mm

in depth. In the herd studied this condition was always associated with trichomoniasis. It was present also in uninfected animals cows leaves little doubt that this venereal infection was responsible for much of the trouble. The loss of 100 months production

TABLE I.—Breeding History of the Experimental Dairy Herd for Approximately Eight Years

	Bulls used	No. of Services	Calves* born	Services* per calf	Retained placentas	Abortions** due to trichomonads	Trichomonas infections, no abortion observed	Months of production lost as a result of sterility or abortion		
								Heifers	Cows	Total
1932	Walker	50	17	2.9	3					
	H 123	33	0							
	H 145	14	6	2.3						
Totals or averages		97	23	4.2	3			79.5	11.0	90.5
1933	Walker	13	3	4.3						
	H 145	49	22	2.2	2					
Totals or averages		62	25	2.5	2			35.0	13.0	48.0
1934	H 145	92	31	3.0	4			76.0	26.0	102.0
1935	H 145	63	24	2.6	3					
	H 93	22	8	2.7	2					
Totals or averages		85	32	2.7	5			61.0	26.0	87.0
1936	H 145	41	14	3.0						
	H 169	58	6	9.7	3					
	H 544	11	8	1.4	1	1	5			
Totals or averages		110	28	3.9	4	1	5	119.5	107.5	227.0
1937	H 145	36	4	9.0			2			
	H 169	17	9	1.9	3	1				
	H 544	27	11	2.6	1					
Totals or averages		80	24	3.3	4	1	2	32.5	60.5	93.0
1938	H 145	32	12	2.7		1	7			
	H 169	7	2	3.5	1	1				
	H 544	58	12	4.8	1					
Totals or averages		97	26	3.7	2	2	7	58.0	26.5	84.5
1939 (to Oct. 1)	H 145	24	12	2.0						
	H 544	13	6	2.2						
	H U1	41	17	2.4						
Totals or averages		78	35	6.6				45.0	23.0	68.0
Totals or averages for 7 yr., 10 mo. period		701	224	3.17	24	4	14	506.5	293.5	800.0

*Figures for 1939 include apparent pregnancies rather than calves born.
**Two abortions occurred in 1933 following services made by bull H 145. Examinations were not made for trichomonads.

and especially in heifers shortly following their first breeding. A large percentage of all animals of breeding age, including non-virgin heifers, of the Experiment Station dairy herd manifested this condition. Granular vaginitis apparently is much more widely disseminated than trichomoniasis.

During the eight years over which breeding records on this herd were compiled, a total of 800 months of productive periods were lost because of delayed impregnation (Table I). While not all of this loss can be attributed to trichomoniasis, the individual breeding history of the cows and the later microscopic diagnosis on a portion of the per year is equivalent to feeding eight cows for a period of a year with no production of milk or offspring. In the case of cows which are milking, the lactation is prolonged because of delayed parturition, so that the economic loss is partially recovered, but in the case of heifers the non-productive period is entirely a loss with the exception of some gain in body weight. Each year, with the exception of 1937, the greatest loss in productive period was encountered in the heifer group. There was an average of 11.4 heifers added to the breeding herd each year, or a total of 91 heifers for the eight-year period. Only 13

of these were settled as the result of one service, the remainder requiring two or more services; 13 failed to settle after many services and were sold. Two of the four visible abortions (trichomonas etiology) which occurred during the eight years of observation were in the heifer group. As will be noted in Table I, 63% of the productive period lost as the result of sterility or abortions was in the heifer group, in spite of the fact that it comprised on the average only 27.5% of the herd.

The trichomonas organism was definitely recognized in 18 animals in this herd during the period 1936 to 1939. Of this number 10 apparently completely recovered and gave birth to normal calves. Breeding difficulties persisted in eight animals, and they were sold for slaughter.

Summary and Conclusions

Three observations indicated that in the female the uterus is the primary site of infection: (1) After exposure to infection, animal H 300 became positive to examination for 11 days, then negative for 30 days and then returned to positive for 31 days without further exposure. All examinations were made from vaginal contents. (2) In every case of infection an occasional negative diagnosis was made during the period when most diagnoses were positive. (3) Examination of the genital tract of animals H 300 and H 329 showed that the mucopurulent exudate was being discharged from the uterus. These data indicate that trichomonads are found in the vagina, in some cases, only as they are discharged from the uterus. In one heifer, however, trichomonads were demonstrated in the vagina, six months prior to birth of a normal calf.

It appears that two courses of infection were manifested in this herd. The one course was characterized by the discharge of purulent exudate and trichomonads from the uterus for approximately 18 days, after which discharges ceased, the uterus returned to normal, parasites were no longer demonstrable, and normal breeding cycles were resumed. The other course, illustrated by H 300, was characterized by uterine discharges for about 11 days with positive findings, after which discharges ceased for 30 days, during which period examinations were negative for trichomonads. This was followed by another period of 31 days during which there was purulent discharge from the uterus and parasite examinations were positive. It is likely that H 329 and H 323 had a disease course similar to that of H 300.

Experience with nine definitely diagnosed cases of this disease during 1936 and 1937 showed that three animals recovered and calved. Three animals were not bred following their detection and were sold for slaughter, and the remaining three animals were bred but proved to be sterile, presumably as a result of their uterine infection. The experience in 1938 and 1939 showed a higher incidence of recovery. Seven of nine infected animals recovered and gave birth to normal calves, or are now in advanced pregnancy. Two of these received treatment; the others did not.

During the entire period of study, 1936 to 1939, a total of 18 cases of infection in females and two cases in bulls were found. Ten of the females made complete recoveries. This suggests that to a certain extent trichomoniasis of the cow is a self-limiting disease. It seems likely that some cows will require corpus luteum enucleation before recovery can be effected. An antiseptic uterine douch in the one case tried, appeared to have a good effect on recovery. Inasmuch as no new infections have developed as the result of service by bull H 145 since he was last treated, it seems possible that such treatment was efficacious.

The culture method of diagnosis used was found to be more satisfactory than the earlier method of direct microscopic examination.

During the eight years of observations, 506.5 months of production were lost in temporarily and permanently sterile heifers. The cows during the same period lost 293.5 months of production, the economic loss of which was partially overcome by extended lactation periods.

A Practitioner's Experience with Equine Encephalomyelitis

By H. J. MAGENS, Tahlequah, Oklahoma

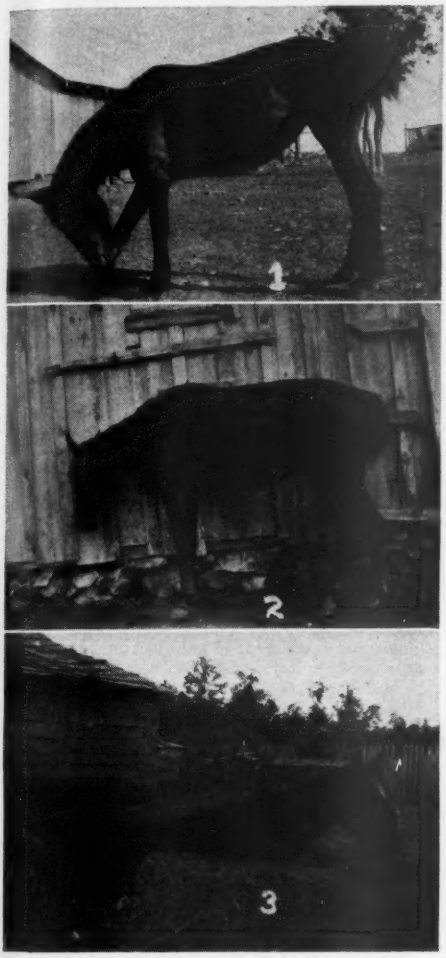
ON comparing the recommendations in the recent literature on this subject with their practical application, one must be forced to admit that in many cases these recommendations apply only in theory. Everyone concerned agrees that prophylactic double vaccination with a reliable chick vaccine is at the present the best method to protect horses and mules from this disease in its enzootic dimensions over large areas. Consequently all agencies concerned such as the County Agents' offices, the various offices of the Farm Security Administration, the farm editors of the various papers and others began an early campaign to make this method as widespread and popular as possible. Form letters by the thousands were mailed, circulars were distributed, numerous talks and demonstrations were held. The financial aspect of the matter was taken into consideration and grouping of animals at convenient centers was practiced and a minimum fee collected. What was the net result? Less than a hundred animals were properly immunized over a large area in Oklahoma.

In the main, the places where infestations have been reported in former years were those where vaccination was at all considered. Even here, double treatments were decidedly the exception, not the rule. The value of the treatment was generally admitted only by those who had had previous experience with it, or who had lost heavily with unvaccinated animals. In many instances, owners were afraid to vaccinate pregnant mares. In other instances, geldings and mules were not treated because they were believed to be immune, or at least less susceptible. Others again were afraid that stallions and jacks would become sterile if vaccinated. The idea that forage poisoning (so-called blind staggers) is identical with encephalomyelitis was widespread and proved a severe handicap to the introduction of progressive methods. The fact that active cases do not occur until rather late in the season—in late August, October and early November—partly explains the lack of enthusiasm for measures advocated in the early spring. The greatest obstacle of all, however, was inability to pay, not only for prophylactic but also for curative treatment, which is even more expensive.

■ As the disease made its appearance it was up to the practitioner to minimize the economic loss arising therefrom as much as possible, and to restore the animal's productiveness as soon as possible. With these points in mind, I thought that the employment of large doses of encephalomyelitis anti-serum would give the best results, and the first few cases were treated accordingly. The results were uniformly gratifying. The serum was given intravenously in doses from 200 to 450cc, usually for three consecutive days. In some cases there were severe reactions, and medication to overcome them was used.

The cost of these treatments, however, is relatively high. The amount of serum was therefore cut down and normal horse serum substituted. The results seemed similar. In several cases reduction of cost was again imperative; also, a sufficient amount of normal horse serum was not obtainable soon enough, so citrated whole blood, freshly drawn, was substituted for the whole normal horse serum treatment. At first larger dosages of the mixture were employed, but experience showed that many animals could not submit to these larger doses without showing typical symtoms of anaphylactic shock, in some cases very severe. I found that treatment for three successive days was most beneficial. Dosage was reduced or increased according to the degree in which existing symptoms

had subsided. For instance, if the animal in the beginning of the treatment showed a partial paresis of the larynx with a very distinct inability to swallow and loss of equilibrium or muscular incoordination, and these symptoms following the first dose had materially lessened, with an accompanying improvement of the general condition, then the second dose was reduced. However, if the symptoms were not improved or had become worse, then dosage was increased. (In some cases it was necessary to reduce the dose regardless of symptoms, because of anaphylactic reactions, which were usually worse on the second day of treatment. Whatever solution is to be injected, best results are obtained by warming it to body heat.)



1. Light draft mare, three years old, as she appeared on the first day. Treatment consisted of encephalomyelitis serum only. The mare made an uneventful recovery.

2. Four-year-old saddle mare as she appeared on the third day of treatment. This was a very severe case. Encephalomyelitis serum, normal horse serum, and citrated blood were given four times. Recovery took place in six days.

3. Twelve-year-old saddle mare on the sixth day of an attack. On the preceding day she had received normal horse serum plus citrated blood. Altogether three injections were given. Many gallons of water were given via the stomach tube. This mare recovered in 10 days.

Close attention was paid to the animal's behaviour during intravenous administration. If the animal began to tremble, breathed hard, became nervous, if it suddenly evacuated the bowels and the bladder, if the eye became fixed and staring, the needle was withdrawn at once. In some of these cases administration of the remaining dose at a later hour was chosen; in others, intramuscular injection at various places proved safe. Intramuscular injections of the same or even slightly larger dosage were tolerated without any accidents.

Several cases, some because they occurred unexpectedly and in unaccessible places, and others because the owners were unable to pay even for a small amount of normal horse serum (100 to 150cc per treatment), were treated only with freshly-drawn citrated blood. Treatments with whole blood did not show the marked improvement produced by other treatments on the first day: Improvement was always noted, but it was somewhat slower. On the other hand, recurrences were fewer. Anaphylactic shock occurred more frequently than with the other two treatments, necessitating more intramuscular injections.

■ In all cases where temperatures of 104° to 106° F. were noted and marked dehydration was prominent, the stomach tube was used effectively to supply water. In extreme cases owners were instructed to use slightly salted water for rectal irrigation about four times daily, not more than a gallon or even

a half-gallon being given at a time, administered very slowly to promote absorption. These treatments proved helpful also in promoting bowel and bladder evacuation, which were often sluggish in these cases.

Another accessory treatment of great value consisted in placing cold water compresses or icebags on the head. Shade was provided for all animals. Water and feed was placed in such a manner that they were accessible to the animals without the necessity of bending over to get them, their throats being frequently affected. Fresh, deep, clean bedding was helpful in keeping them from becoming bruised. Confinement in stables was advised where there was sufficient room to avoid the danger of casting. Animals often use structures such as mangers, walls, separating bars, etc., as support.

■ It has been stated that many animals will recover without any medical interference. However, my experience during the last two outbreaks in a distinctly horse-conscious country has taught me that owners demand action and speedy results. That the time of recovery and convalescence can be cut down materially is an economic factor of importance and should warrant and justify all efforts on the practitioner's part towards that end.

SOME INTERESTING CASES ENCOUNTERED IN GENERAL PRACTICE

(Opposite page)

1. These mules, about two years old, were brought to the hospital with ears in the condition shown in the illustration. They had been like this several weeks, the condition coming on gradually. The cartilage was thickened at the point of breaking over, but was otherwise normal. Cause unknown. Can anyone explain it? We amputated the ears at the point of break.

2. A steer recovering from "milk fever." This is the only case we have observed, and so far as we know the only one on record. This picture was taken about 15 minutes after the steer was given 500cc of calcium gluconate intravenously. He presented all the typical symptoms of milk fever, even to a prompt recovery.

3. This picture is presented as proof that the old myth of "hollow tail" is not without some basis in fact. This cow was just recovering from an attack of milk fever following dystocia. Note how the tail breaks at a right angle from the hand. The tail will hang with a curve when held at this point when the animal is not affected with the condition known as "hollow tail." You explain it.

4. Brachial paralysis occasionally follows severe colic that causes the animal to throw itself about. This always passes off in a few days.

5. These three bitches from one litter were spayed at the same time. HMC and chloroform were used, an old method of anesthesia in dogs that we learned at the Chicago Veterinary College 33 years ago. It has proved satisfactory in most cases where an anesthetic is desired. It is less dangerous, more fool-proof, and we like it better in most cases than the methods more commonly used recently.

6. An habitual victim of luxation of the patella. The illustration shows the rigging kept on him for two weeks. This prevented extension of the leg backward, which invariably caused the patella to slip outward and lock the leg. The animal recovered. Blisters applied to the region of the patella were repeated every week.

7. A two-year-old registered Jersey heifer with a history of being sick about 10 days. Diagnosis: traumatic pericarditis; prognosis unfavorable. We operated and recovered several nails and pieces of sharp wire. Note the characteristic abducted elbow. The heifer died about two weeks after operation and autopsy confirmed diagnosis by revealing about four gallons of a mixture of pus, fibrous material and liquids in the heart sac. No other lesions were found. Four cases operated on during the previous few months all recovered, but diagnosis was made early in the condition.

8. This is another one of our patients, Uncle Jack. His age cannot be ascertained with any degree of certainty. He is surely a "smooth mouth," for he fought the Yankees through the Civil War with Marse General Forrest. He has been our steady patient for ten years. If he doesn't come every day he will make it to our office every other day complaining that his "water is too free" or that his twisted and contorted legs and back, from which he has suffered for many years from some disease that isn't explained in Merillat's book on Veterinary Surgery, hurt him "mos' powerful." During the course of a year we furnish him many gallons of liniment to rub on his various "miseries," also much medicine without potency, that he takes with due regularity—neither of which do any good, but he says that he cannot live without them. He positively will not have any other "doctah," and since he is likely more than 100 years old, everyone humors him.—*J. T. Alston, Tupelo, Miss.*

A Note on the Effect of Tapeworm Infestation on the Condition of Sheep

By D. A. SHORB, Washington, D. C.
Zoölogical Division, Bureau of Animal Industry, U. S. Department of Agriculture

TAPEWORMS are commonly believed to be serious parasites of sheep. The reasons for this belief are largely impressionistic but quite obvious. Tapeworm segments are often found in the droppings of sheep running on pastures and showing clinical evidence of parasitic infestation. On postmortem examination of such sheep, tapeworms are usually found in the small intestines in varying numbers. The presence of other parasites, particularly small nematodes, may not always be, and usually is not, taken into consideration. Hence, the condition of the infected animals is ascribed to the tapeworms present. Experimental evidence,[1] admittedly too limited in extent to be conclusive, suggests that the seriousness of tapeworm infestation may be overestimated at times.

Corriedale Ewes at the U. S. Sheep Experiment Station at Dubois, Idaho.

Freeborn and Berry[2] approached the problem of the effect of tapeworm infestation from a different angle. In a group of 24 sheep they found no material difference in weight between tapeworm-infested and tapeworm-free animals. Having determined that differences in weight could not serve as an indication to the effect of tapeworm infestation, they attempted to determine the effect of such infestation by having the sheep graded into the market classes of Prime, Choice, Good, Medium, and Common. By giving a numerical value of 5 to the Prime lambs and decreasing the value by 1 for each succeedingly less valuable class, down to a value of 1 for the least desirable, they arrived at the following result in which a perfect score would be 5: Average grade of tapeworm-infested sheep, 2.16; average grade of sheep from which tapeworms had been removed by treatment, 2.66; average grade of sheep not suffering from tapeworm infestation, 4.33. Thus the conclusion was reached that lambs never subjected to tapeworm infestation are more pleasing in appearance and more valuable to the buyer. Since no other factors that might influence this grading are mentioned, one may infer that the authors intended to convey the impression that this difference in grade was due solely to the tapeworm infestation.

Some information on the correlation between tapeworm infestation and finish in sheep was obtained from a group of 113 sheep uninfested with helminths except tapeworms of the genera Moniezia and

[1] Shorb, D. A., 1939. Preliminary observations on the effect on sheep of pure infestations with the tapeworm, *Moniezia expansa*. Proc. Helm. Soc. Washington, 6:2, pp. 77-79.

[2] Freeborn, S. B., and L. J. Berry. 1934. Observations on the sheep tapeworm, *Moniezia expansa*, in California. *J. A. V. M. A.*, 85:5, pp. 611-616.

Thysanosoma, as determined by post-mortem examination. Seventy-one of these sheep harbored tapeworms and 42 were free from tapeworms. These animals were well-bred, seven-month-old range sheep which had been brought directly from the range to the U. S. Department of Agriculture Research Center, Beltsville, Md., for slaughter. They were graded by experts of the Bureau of Agricultural Economics and of the Bureau of Animal Industry. In grading sheep arbitrary numbers are used and an average of the numbers assigned to the animal or carcass by the different graders indicates the final score. Except in the Prime grade, in which there are 4 subgrades represented by the numbers 1, 2, 4, and 6, there are 3 subgrades for each grade and the numerical value of each subgrade increases by 2 for each point decrease in grade of carcass. The lower the number assigned, therefore, the better the carcass.

TABLE I.—Effect of Infestation with Moniezia, Thysanosoma, and Moniezia plus Thysanosoma, on Grade of Carcass

Type of infestation	Number of sheep	Average number of tapeworms per sheep	Average grade of carcass	
			Numerical rating (scale 1-36)	Descriptive designation
Moniezia	4	1	22.5	Average Medium
Thysanosoma	35	11.20	24.0	Low Medium
Moniezia plus Thysanosoma	10	18.60	22.8	Average Medium

The average grade of the carcasses of both infested and worm-free animals in this group was "average Medium," the average numerical rating being 23.2 and 22.8, respectively.

In order to determine whether there was any material difference in grade between sheep infested with Thysanosoma and those infested with Moniezia, the kind of infestation was determined for 49 of the 71 tapeworm-infested sheep. Of these 49, four had Moniezia only, 35 had Thysanosoma only, and 10 had a mixed infection of Moniezia and Thysanosoma. The animals infested with Moniezia only, and those with a mixed infection of Moniezia and Thysanosoma were graded "average Medium" and those infested with Thysanosoma only graded "low Medium" (Table I).

In order to determine further whether the degree of infestation had any influence on the grade of carcass, the grades and subgrades in which the 49 infested sheep carcasses were placed were examined and the average number of tapeworms harbored by each animal in each subgrade and grade was ascertained. The results are presented in Table II.

It is apparent from the figures presented in Table II that there is no relation between the degree of infestation with tapeworms and the grade in which the carcass was placed.

TABLE II.—Relation of Infestation to Grade of Carcass

Data for carcass sub-grades			Data for carcass grades		
Number of sheep	Average number of tapeworms per sheep	Sub-grade of carcass	Number of sheep	Average number of tapeworms per sheep	Grade of carcass
3	10.00	Average Good	7	12.43	Good
4	14.25	Low Good			
5	17.00	High Medium	26	12.23	Medium
5	3.80	Average Medium			
16	15.95	Low Medium			
11	9.45	High Common	12	9.91	Common
1	15.00	Average Common			
none	—	Low Common			
1	11.00	High Cull	4	7.25	Cull
3	6.00	Average Cull			

A consideration of the grades only seems to indicate that the better animals harbored the greater number of tapeworms.

The figures presented in Tables I and II indicate that the tapeworm infestation harbored by the animals under consideration did not materially influence the appearance and condition upon which grades are based.

In this connection it is interesting to note that Christensen[3] found no relationship between deaths of sheep occurring in a feed lot and infestation with *Thysanosoma actinioides* and that, except in heavy infestations, these infestations were of no importance to the health of the infested sheep.

[3] Christensen, R. O., 1931. An analysis of the reported pathogenicity of *Thysanosoma actinioides* in adult sheep. *J. Agric. Res.*, U. S. Department of Agriculture, 42:4, pp. 245-249.

The Time of Ovulation in the Bitch

By LEON F. WHITNEY, Auburn, Alabama
Alabama Polytechnic Institute, Class of 1940

IN A previous paper the author[1] attempted "to exhibit the correlation between the processes taking place in the ovaries and the uterus on the one hand, and the external signs on the other." This paper was actually a combination of observations and data dealing with: (1) the time of ovulation; (2) the divisions of the estrus cycle; (3) the life of the sperm in the bursa ovarii; (4) seasonal occurrence of estrus cycles in 4,242 matings; (5) the sex ratio in 49,650 German shepherd dogs. Following the publication of this paper Herbert McE. Evans and Harold H. Cole[2, 3] published three papers on this subject.

■ The chief difference between the studies previously reported and the data contained in the present paper is that these data are drawn not from dogs obtained from city pounds nor dogs whose environments have been suddenly changed, as was the case in the earlier papers, but from dogs that belong to the author and that have been maintained in the same environment for at least a year and in many cases several years. All have been fed approximately the same ration and have been subject to the same climatic conditions, so that the environment has been unusually similar.

Every observation pertaining to the data presented in the former paper and this one was made personally by the author. One point which should be emphasized is that in order to make such observations one must attend constantly to the dogs oneself or some of the finer points easily escape notice. The determination of the first day of the acceptance period in a bitch, for example, would certainly not always be made the same by two observers, when one virtually lived with the dogs and the other did not.

Some bitches actually show a desire to copulate and stand for the dog until the penis enters the vagina, which may be very tender. Under these conditions the bitch jumps away and refuses mating until the vagina has lost its sensitivity. In some of these bitches the clitoris is so large, due to congestion, that one scarcely would think that there would be room for the dog's penis to pass it. Some bitches are especially sensitive. The time at which the bitch may be ready to copulate under such conditions is sometimes several days before the vagina reaches a condition to allow it.

Determination of the last day of acceptance may be equally difficult. Some bitches respond, on the early and latter days of the acceptance period, only to the teasing of a virile stud dog; while others exhibit playfulness, which might make an uninitiated observer believe they were ready to copulate, when actually they are only playing. Sometimes, on the last day of acceptance, experienced, virile stud dogs smell of a bitch once and have nothing more to do with her, which might lead some observers to conclude that the bitch was no longer ready to copulate; but when a young, less experienced dog attempts it the bitch stands. Again, some bitches appear to be all over their period on one day and the next day may copulate with a different dog than the one which has been refused previously. These and many other vagaries of the bitch during the heat period emphasize the necessity for keeping her under uniform conditions and practically constant observation at this time to avoid being misled.

If records of long haired dogs were used, the number of data presented in the table would be almost doubled, but experience shows that too many details may be missed to make their use practicable. The long hair covering the vulva and surrounding area makes it necessary to resort to palpatation. Thus, the data from all such dogs

[1] Whitney, L. F., 1927. The mating cycle of the dog. *Chase Magazine*, July.
[2] Evans, H. M. and H. H. Cole, 1927. The oestrus cycle of the dog I and II. *Jour. Anat.*, Nos. 10 and 11.
[3] Evans, H. M. and H. H. Cole, 1931. Memoirs Univ. of Cal., 9:2.

have been discarded for purposes of this study.

As every dog breeder knows, the swelling of the vulva is an indication of an approaching mating cycle. Even this is generally preceded by a period of greater appetite and increased food consumption, but only the careful observer notes this. Naturally, the keener appetite is much better observed in dogs at home and familiar with the kennel surroundings than it is in dogs which are obtained from the local pound and which are dropped down into unfamiliar surroundings, often in a state of nervousness.

The Evans and Cole data, and those of my previous paper, covered some of the same subjects, especially the divisions of the estrus cycle, the time of ovulation, and the correlation of vaginal smears with these phenomena. It was a surprise to find that Evans and Cole should have reached a conclusion so markedly different on one all-important point—the time of ovulation.

■ The present paper presents new data collected between 1931 and 1938 on a much larger series of animals than has been studied previously.

The number of dogs at the Whitney Kennels at Orange, Connecticut, usually runs from 100 to 200. They are all kept out of doors, are subject to climatic changes, furnish their own heat in winter in ¾" board houses and have had relatively the same diet over a long period. At least 5,000 puppies have been whelped in the kennels; it is the author's endeavor to raise as many puppies for study and for sale as possible, because the sale of puppies of several pure breeds has enabled him to carry out genetic and other experiments. Naturally such valuable dogs were not sacrificed, and the study, therefore, was confined to a determination of certain facts from external phenomena.

Of the hundreds of estrous cycles which have transpired, it has not been possible to make accurate, detailed observations on as many bitches as would have been ideal, but nevertheless, the number observed is appreciable, as will be seen in the following data. Most of the estrous cycles at the author's kennels have been observed in some particular. In fact, all of them have been observed as to the dates of copulation and parturition, but only a small proportion of these are used in the data which follow because the records of most cycles are not sufficiently complete. Where there was any uncertainty as to any important feature in the estrus the entire cycle was discarded.

The determination of the time of ovulation in the author's first paper[1] was based on the records of 13 bitches. Of these, one bitch, which was sacrificed on the 11th day after bleeding commenced, had not ovulated. Another was sacrificed on the 13th day, two on the 14th, and one on the 15th. All showed intact follicles and no corpora lutea. Others, sacrificed later, showed corpora lutea, irrespective of copulation. These phenomena were correlated with vaginal smears which had been made daily from each bitch. In contrast to my data, the conclusion of Evans and Cole as to the time of ovulation is: "The most important single event, ovulation, is more definitely related to first acceptance than to any other sign, and the latter is accordingly the most important single fixed point. . . . Ovulation is spontaneous and appears early in estrum, usually within a day of first acceptance of coitus. It is remarkable that the dog continues in active estrum for somewhat more than a week after ovulation."

■ Table I shows a list of 61 matings, from the day of first acceptance, to the day of last acceptance and the day of birth of the litter. The bold face type indicates the days coitus was permitted and the parentheses the date when conception most likely occurred, determined by counting back 61 days.[4] In this table are included only those cases in which the bitch was bred repeatedly throughout the acceptance period. Table II contains an additional number of records of matings in which the bitch was bred only toward the beginning or toward the end of the acceptance period but not throughout the whole period. In both tables only heat periods that were followed by the

TABLE I

DURATION OF ACCEPTANCE PERIOD

Days bred in bold face. Probable conception date ( )

Mo.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Birthday
4	23	24	25	26	**27**	28	**29**	**30**	**(1)**								7-1-31
4	**30**	1	2	3	4	**5**	6	**(7)**	8								7-7-31
5	**(5)**	6	**7**	8	**9**	**10**	11	12									7-5-31
6	**10**	11	12	13	(14)	15	**16**	**17**									8-14-31
9	6	**7**	8	9	(10)	**11**	**12**	**13**	**14**								11-10-31
1	5	6	**7**	8	9	**(10)**											3-9-32
3	**12**	**13**	**(14)**	15	16	**17**	**18**	**19**	**20**	21	22	23	**24**				5-14-32
11	7	8	9	10	**11**	(12)	13	14	15								1-12-32
4	3	4	**5**	6	7	8	**(9)**										6-9-33
5	4	**5**	6	**7**	8	9	10	(11)									7-11-33
5	**13**	14	**15**	16	**17**	18	19	(20)	**21**								7-20-33
6	**11**	12	**13**	**14**	15	**(16)**	17	**18**									8-16-33
10	6	7	**8**	9	**10**	11	**(12)**										12-12-33
5	**31**	**1**	**2**	(3)	**4**	5	**6**	7	8	9	10	11	12	13	14		8-3-34
5	31	**1**	2	(3)	4	5	**6**	7	**8**	9	10	11					8-3-34
6	2	3	**4**	5	**6**	7	**8**	9	**10**	11	**12**	13	(14)				8-14-34
9	2	3	4	5	**(6)**	**7**	8	9	**10**	11							11-6-34
9	2	**3**	4	**(5)**	6	7	8	**9**									11-5-34
9	28	29	**30**	1	**2**	3	**4**	5	**6**	7	8	**(9)**	10	**11**	12		12-11-34
11	7	8	9	(10)	11	**12**	13	**14**	15	16							1-10-34
3	31	1	2	**(3)**	4	**5**	6	**7**	8	9	10						6-3-35
4	16	17	**18**	19	(20)	**21**	22	**23**	24	25	26	27	28				6-20-35
6	8	9	10	**(11)**	12	13	14	**15**	16	17	**18**						8-11-35
9	9	10	11	12	13	**(14)**	15	16	17	18	19	20	21				11-14-35
9	9	**10**	11	12	(13)	15	**15**	16	**17**								11-13-35
9	(9)	**10**	11	12	13	14	**15**	16									11-8-35
9	22	23	24	**25**	**(26)**	27	28	29	**30**	1	**2**	3	4	5	**6**		11-26-35
12	25	26	27	**28**	29	30	31	**1**	2	(3)	4	**5**	**6**				3-5-36
2	**19**	20	21	22	23	(24)	25	26	27	**28**	1	2	3				4-26-36
3	6	7	**8**	9	**10**	11	**(12)**	13	**14**								5-12-36
4	(5)	**6**	**7**	8	9	10	**11**	12	**13**	14	15						6-5-36
4	**11**	12	**13**	14	**15**	16	17	**18**	19	20	**21**	22	**23**	(24)	**25**	26	6-25-36
4	20	21	**22**	**23**	24	**25**	26	**27**	(28)	**29**	30	1	**2**				6-28-36
4	21	**22**	**23**	24	**25**	26	**27**	(28)	**29**	30	1	2					6-28-36
4	22	23	24	25	26	**27**	28	**29**	30	(1)							7-1-36
6	15	16	17	**18**	19	(20)	21	**22**	23	24	25	26					8-20-36
6	20	21	22	**23**	35	25	**26**	(27)									8-27-36
8	**9**	10	11	12	(13)	14	**15**	**16**	**17**	18	19	20	21				10-13-36
8	15	16	17	**18**	**19**	20	**21**	22	23	24	(25)	**26**	27	**28**	29	**30**	10-25-36
8	17	(18)	19	**20**	**21**	22	**23**										10-18-36
9	17	18	19	20	**21**	(22)	**23**										11-22-36
9	21	(22)	23	**24**	**25**	**26**											11-22-36
12	8	9	**10**	11	**12**	(13)	**14**	15									2-12-36
1	9	**10**	(11)	12	13	14	15										3-13-37
6	15	16	17	**18**	19	(20)	21	**22**	23	24	25	26					8-20-37
6	29	30	**1**	2	**3**	(4)	5	6	**7**								9-3-37
7	10	**11**	(12)	**13**	14	15	16	**17**									9-11-37
7	26	**27**	28	29	**(30)**												9-29-37
8	17	18	**(19)**	20	21	**22**	23	**24**	25	26							10-19-37
8	**30**	31	1	(2)	**3**	**4**	5	**6**	7	8	9						11-2-37
8	**30**	31	1	**2**	**3**	**4**	5	**6**	(7)	8	9	10	11				11-7-37
9	9	10	11	**12**	13	**(14)**	15	**16**	**17**	**18**	19	**20**	21				11-15-37
9	26	27	28	29	**30**	(1)	**2**	3	4	**5**	6	**7**					12-1-37
11	17	18	19	20	21	**22**	23	**(24)**	25	**26**							1-24-37
12	9	10	11	12	**13**	14	**(15)**	16	17	18							2-15-37
1	31	1	**2**	3	**4**	5	**(6)**										4-8-38
3	31	1	2	3	4	5	**6**	7	(8)								6-8-38
4	12	13	14	15	**16**	17	**18**	(19)	**20**	21	**22**	23	24	**25**	**26**		6-19-36
4	29	30	**1**	2	3	4	5	6	**7**	8	**(9)**	10	**11**	12	13	**14**	7-9-38
5	31	**1**	2	**3**	(4)	**5**	**6**	7									8-4-38
6	**16**	17	**18**	19	**20**	21	**22**	23	24	**25**	**26**	27	28	(29)			8-29-38

TABLE II

DURATION OF ACCEPTANCE PERIOD

Mo.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Birthday
3	**26**	27	28	29	30	(31)	**1**	**2**	**3**	4						5-31-33
5	27	28	29	30	31	(1)	2	**3**	4	5	**6**	**7**	8			8-1-34
10	**9**	10	11	12	(13)	**14**	**15**	16	**17**	18	**19**	20	**21**	22	**23**	12-13-35
2	2	3	(4)	5	6	**7**	8	9	**10**							4-6-37
3	1	2	3	4	**(5)**	**6**										5-5-37
1	17	18	19	20	21	22	**23**	(24)	25	26						3-26-38
4	4	5	6	**(7)**	8	**9**	10	11	12	13	**14**					6-7-38
12	4	5	6	7	8	9	10	(11)	**12**							2-10-38
9	9	10	11	12	(13)	**14**	15	16	**17**	18	19	20	21			11-13-35
8	17	**(18)**	19	**20**	**21**	22	**23**									10-18-36
9	31	1	2	3	4	5	**(6)**	**7**	8	9	10	**11**	12	**13**		12-6-37
6	**26**	27	28	29	**30**	(1)	2	3	4	5	**6**	7				8-31-38

delivery of puppies are recorded. From these data it follows that conception is possible when matings are made during the latter half of the acceptance period. The day of conception is calculated from the date of birth of the litter. As determined by Whitney[4] the gestation period in the bitch is very close to 61 days, with variations. There are many instances where this day does not fall upon a day when the dogs were mated. This fact can be explained on the basis of variability among the bitches bred and also by the fact that sperm can live several days within the ovarian bursa. In the author's previous paper, the data indicate that this is possible, although no live sperm were found as long as four days after mating. As will be seen from this table, the day of ovulation is approximately the middle of the acceptance period. Note the great variation in the duration of the acceptance period in different bitches.

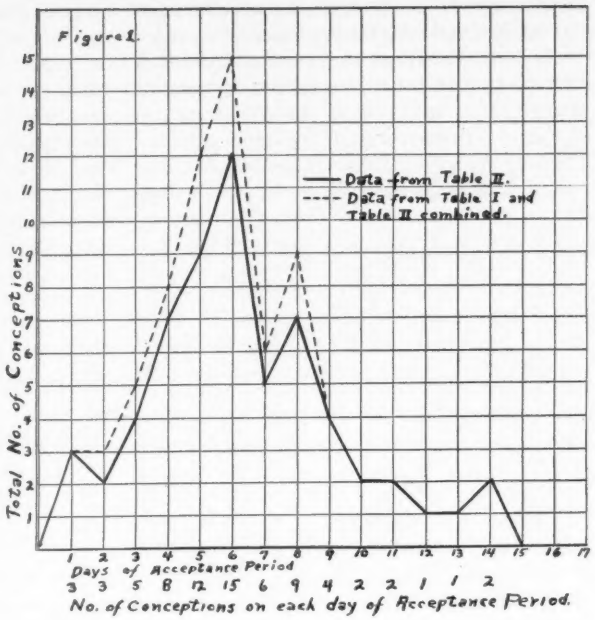


Figure 1.
Total No. of Conceptions
Data from Table II.
Data from Table I and Table II combined.
Days of Acceptance Period
No. of Conceptions on each day of Acceptance Period.

Observations made on one of the author's bloodhound bitches over a period of four years are interesting at this point. The acceptance periods of the seven estrous cycles observed have all been over 12 days in duration. This bitch has produced but four litters of puppies. One of these was composed of only two puppies. In going back over her record it is obvious that when she was mated during the first week of the acceptance period she failed to conceive in all three instances, and the four periods that resulted in conception were those in which she was bred after the 7th day. The dogs to which she was bred were virile, fertile dogs in all cases. On her 6th cycle she was bred on the 3rd, 5th and 7th days and failed to conceive; on her 7th she was bred on the 9th, 11th and 13th days. The last day of the acceptance period was not determined. Probably one of the reasons for the high fertility among the dogs in the author's kennels is the fact that the bitches are bred for the most part after the middle of the acceptance period. One bitch bred in this way has produced 96 puppies in six litters.

Figure 1 shows graphically the period of greatest fertility in the bitch on the basis of the data in Table I; the broken line represents a combination of Tables I and II.

■ If one accepts the conclusions of Evans and Cole, it would follow that fertilization takes place only after the ova have left the ovaries and spent several days in the Fallopian tubes or horns of the uterus. By the second day, eggs were found in three out of four cases in the middle of the oviduct and in one still attached in follicles. On the third and fourth days the eggs were found in every case in the middle portion of the oviduct. From the sixth day of the acceptance period onward they were in the

[4] Whitney, L. F., 1940. The gestation period in the bitch. *Vet. Med.* 35:1, pp. 59-60.

uterine end of the oviduct. During the first day of the metaestrus, eggs were found in every case either in the uterus or in the uterine end of the oviduct. Thus if the assumption be made that the ova have to reach a definite stage of maturity outside of the follicles before fertilization can occur, it is difficult to explain why the sperm are so easily recovered from the ovarian bursa within 20 minutes after copulation begins, which is the case. Moreover, if this assumption were true, it is a different situation than one finds in many other species where apparently it is a matter of hours rather than a matter of days that the ova remain in the condition to be fertilized. If the author's data do indicate, however, that the canine ovum is viable for several days, again it may be argued that his method of counting back 61 days from parturition to determine the approximate day of copulation is a mistake and that the gestation period is a matter of the length of time from implantation of the ovum until parturition. Evans and Cole's data indicate that the ova require six days to traverse the oviduct to the uterus.

But even if this were so it would not explain the data shown in Table III, where the same bitch was bred to two or more

TABLE III

1. Molly—Bloodhound.
   - First day of acceptance — March 12, 1932
   - Bred to pointer — March 13
   - Bred to dominant red hound — March 14
   - Bred to pure bloodhound — March 17, 18, 19, 20
   - Seemed to be over period — March 21
   - Voluntarily mated with pointer — March 24
   - Result: All puppies pure bloodhounds, May 14, 1932.

2. Red Bitch.
   - First day of acceptance — June 10, 1931
   - Bred to pure bloodhound — June 10
   - Bred to her brother — June 16, 17
   - Last day of heat — June 18
   - Result: Three puppies sired by brother, Aug. 14, 1931.

3. Bess—Bloodhound.
   - First day of acceptance — April 23, 1931
   - Bred to dominant red hound — April 27
   - Bred to Denabola, bloodhound — April 29, 30, May 1
   - Last day of heat — May 1
   - Result: Three puppies sired by brother, Aug. 14, 1931.

4. Dare—White English Setter
   - First day of acceptance — June 11, 1933
   - Bred to pure bred white foxhound Coonie — June 11
   - Bred to red foxhound — June 13, 14, 16, 18
   - Result: Eight pups sired by red foxhound Aug. 16, 1933.

5. Bee—White Registered Bull Terrier.
   - First day of acceptance — May 31, 1934
   - Bred to Marble, black and white cocker spaniel — June 1
   - Bred to Jack, reg. bloodhound — June 4, 6, 8
   - Last day of heat — June 11
   - Result: All pups sired by bloodhound, Aug. 3, 1934.

6. Carrot—Red Bitch.
   - First day of acceptance — July 23, 1933
   - Bred to Marble, black and white cocker spaniel — July 23, 25, 27
   - Bred to Colonel — July 27, 29
   - Last day of heat — July 29
   - Result: No pups. Following this breeding to both stud dogs showed Marble to be fertile and Colonel to be sterile.

7. Timid—Registered Bloodhound.
   - First day of acceptance — Sept. 9, 1935
   - Bred to Toughy — Sept. 14
   - Bred to very black black-and-tan hound — Sept. 17
   - Last day of heat — Sept. 21
   - Result: All puppies by Toughy, Nov. 13, 1935.

8. Gallagher Bitch—Tri-Colored.
   - First day of acceptance — Sept. 22, 1935
   - Bred to Pal, tri-colored hound — Sept. 25
   - Bred to Jack, black-and-tan bloodhound — Sept. 26, 30, Oct. 2, 6
   - Result: Nine pups, three tri-colors and six solid black and tans. Definitely dual paternity, Nov. 26, 1935.

9. White Samoyed.
   - First day of acceptance — Dec. 8, 1936
   - Bred to pure Samoyed — Dec. 10, 12
   - Bred to black-and-tan bullhound — Dec. 14
   - Last day of heat — Dec. 15
   - Result: Entire litter by Samoyed, Feb. 12, 1937.

10. Pointer—Pure Registered Lemon and White.
    - First day of acceptance — Apr. 20, 1936
    - Bred to Dixie, black-and-tan bloodhound — Apr. 22
    - Bred to Pal, tri-colored hound — Apr. 23, 25, 27, 29, May 2
    - Last day of heat — May 2
    - Result: Entire litter sired by Pal, June 28, 1936.

11. English Foxhound—Tri-Colored.
    - First day of acceptance — Aug. 15, 1936
    - Bred to Handsome, black-and-tan bloodhound — Aug. 18
    - Bred to Pal, tri-colored hound — Aug. 19, 21 26, 28, 30
    - Result: Ten tri-colored pups all from Pal, Oct. 25, 1936.

12. Samoyed.
    - First day of acceptance — Aug. 17, 1936
    - Bred to Samoyed — Aug. 20
    - Bred to Bill, black-and-tan bullhound — Aug. 21, 23
    - Last day of heat — Aug. 23
    - Result: Six pups all from Samoyed, Oct. 18, 1936.

13. Goldie Red (F_2 Bloodhound x Irish Setter)
    - First day of acceptance — June 15, 1937
    - Bred to black-and-white Great Dane (190 lbs.) — June 18
    - Bred to Pal, tri-colored hound — June 22
    - Last day of heat — June 26
    - Result: Five pups by Dane and six by Pal, Aug. 20, 1937. Definitely dual paternity.

14. Mary—Black-and-Tan Bullhound.
    - First day of acceptance — July 10, 1937
    - Bred to Avenger, black-and-tan bloodhound — July 10
    - Bred to Bill — July 13, 17
    - Result: Eighteen pups all sired by Bill, Sept. 11, 1937.

15. Upland Bird Dog.
    - First day of acceptance — June 29, 1937
    - Bred to brother — July 1, 3
    - Bred to Bill, bullhound — July 7
    - Result: All pups by brother, Sept. 3, 1937.

16. Donnie Bitch, Tri-Colored Foxhound.
    - First day of acceptance — Sept. 31, 1937
    - Bred to Pal, tri-colored hound — Oct. 7
    - Bred to Avenger, black-and-tan bloodhound — Oct. 11
    - Bred to Faithful, black-and-tan bloodhound — Oct. 13
    - Last day of heat — Oct. 13
    - Result: All pups tri-colored like Pal, Dec. 6, 1937.

17. Donnie Bitch, Tri-Colored Foxhound.
    - First day of acceptance — June 26, 1938
    - Bred to Faithful, black-and-tan bloodhound — June 30
    - Bred to Pal, tri-colored hound — July 6
    - Last day of heat — July 7
    - Result: Seven black-and-tan pups all sired by bloodhound, August 31, 1938.

dogs on definitely known days of the estrus cycle. In some cases litters from two fathers were produced, while in the majority of cases all of the puppies came from one stud and, as will be seen, this stud was the dog to which the bitch was mated the nearest to the middle of her acceptance period. From the data in this table one can scarcely reach any other conclusion than that ovulation most often transpires some time after the fourth day of the acceptance period.

In determining the gestation period[4] a group of data was used embodying 30 cases where bitches were bred only once during the acceptance period, and conceived. In going over the records, an additional 17 cases are found, of which all details of the cycle are known, where single matings were allowed, which resulted in conception failures. It is quite remarkable that of the 17, 13 took place on the first day of acceptance. If sperm are viable for even two days in the female reproductive tract, as they seem to be, why did all of these bitches fail to conceive if they ovulated at this time as Evans and Cole show that they do?

If, as Evans and Cole's data show, ovulation does occur on the first or second day of the acceptance period, it could be concluded that the ova of the dog are unique in not being ready for fertilization for several days after ovulation. It could be further concluded that the ova must remain viable for periods up to two weeks, if Evans and Cole are right, and that fertilization need not occur in the oviducts but may occur in the uterus many days after the ova have left the oviducts. (Evans and Cole show this to be the sixth day after ovulation.)

Bitches are apt to be fertile the day after the last day of acceptance and in some instances even two days afterward. Of seven bitches that have been force mated in the author's experience, four matings resulted in puppies and three did not. Of these four fertile matings, one was made two days after the last day of acceptance. This would indicate that the ova are capable of living several days after ovulation.

■ A question often considered by those interested in this subject is whether early coitus advances ovulation from the spontaneous time. There is, it would seem, more than a hint from these data, that it does not. The data show many periods dragging on, despite repeated early matings, and conceptions often transpiring rather late.

■ The author cannot explain the discrepancy in the time of ovulation between the figures of Evans and Cole and his own. Possibly the climatic difference may have some effect. Possibly different methods were used in the determination on the first day of acceptance. But most likely the exception is somehow tied up with the fact that this author's dogs were at home and in familiar kennel surroundings when the observations were made and were not dogs brought from points or places in new environments with the attendant excitement and acclimatization. In the case of the author's bitches, nearly all of them knew the dogs with which they were tried, to determine this initial day. These dogs were sometimes allowed to spend several hours with the bitches to tease them and this may have caused natural early copulation.

From a practical point of view, what shall the dog breeder be told—to mate his dogs on the first day they will stand, or sometime after the third or fourth day? The data here presented would indicate quite definitely, that the latter time is best.

Summary

On the basis of the data presented it appears that: (1) ovulation in the bitch takes place most often at some time near the fifth day of the acceptance period; (2) the time of ovulation is quite variable in different bitches; (3) ova may be successfully fertilized for several days after ovulation; (4) coitus at the first of the acceptance period tends to result in sterile mating; (5) from a practical point of view the optimum time to mate bitches for large litters is after the third day of acceptance, some bitches failing to conceive unless mated after the seventh day; (6) copulation does not markedly accelerate ovulation, if it does so at all.

Nutritional Requirements of Dogs

By JOHN W. PATTON, East Lansing, Michigan

THE state of nutrition of a litter of puppies can be no better than that of the dam. Because of the terrific demands made upon her during the period of gestation and lactation, the time to start feeding a litter of puppies is before they are conceived, if we expect them to be at weaning time nutritionally capable of growing into vigorous and healthy dogs. Not alone should we start with a dam well nourished, both quantitatively and qualitatively, but we should maintain her in this condition till the puppies are weaned. A well-nourished dam will regulate her food intake in accordance with her rapidly changing nutritional requirements during the period of gestation and lactation, providing the food furnished her is adequate in amount and quality. Any deficiencies in her daily intake of nutrient factors during this critical period she will provide as far as possible from such reserve as she may have stored up in her body. Should these deficiencies in her daily requirements continue during these critical stages, she will give until the basic law of self-preservation becomes operative. At this stage if there are not enough nutrient factors to go around, she suffers, but the offspring or offspring-to-be suffer even more. The dam becomes weak, devitalized, malnourished, a prospective victim of eclampsia or some other nutritional disorder, and highly susceptible to the invasion of disease-producing microörganisms. The offspring from dams having such a history of nutritional inadequacy may be difficult or impossible to rear. The results of certain nutritional deficiencies produced in intrauterine and early extrauterine life are not possible of correction regardless of subsequent diet, just as skeletal changes in the young animal due to rickets are permanent regardless of how well it may be fed afterward. It is among puppies of this class that we find those inexorably destined to premature death—"squealers." It is here, also, that we find puppies that fail to come up to the expectations of the breeder. These are the pups referred to previously[1] that because of nutritional inadequacy we were unable to keep alive for a period of two weeks following birth in spite of our best efforts to do so; mistake not, there are litters that at the time of birth are destined to premature death because of the poor state of nutrition of the dam during gestation. Further, many puppies die prematurely because of an inadequate diet of the dam during the lactation period. The lives of many dams also are sacrificed or jeopardized by diets inadequate for the strain of maternal duties.

■ An adequate diet is one that is equal to what is required, one suitable to the occasion—fully sufficient; an optimal diet means the best or most favorable diet possible. Herein lies the reason why three out of four dogs suffer in one form or another from nutritional inadequacy. A diet adequate for an adult bitch prior to conception may prove wholly inadequate during the period of lactation. This does not mean that the same dietary regimen may not suffice for all occasions, for a few of the best commercial dog foods are so formulated. It does mean, however, that a diet adequate in the broad sense of the word must be one formulated to provide nutrition that is wholly adequate to meet all the nutritional demands at the most critical periods in the life cycle of the dog. At other times something less may suffice as well.

To illustrate, let us consider for example the vitamin B_1 requirements of the bitch during the period of gestation and lactation. Vitamin B_1 is, of course, essential for appetite and proper functioning of the gastro-intestinal system and for nuclear metabolism. This vitamin is not stored in the animal body to the same degree that

[1] Patton, J. W., 1939. Owning a dog should be a pleasure, not a trial. *Vet. Med.* 34:10, pp. 624-627.

some of the other vitamins are stored; therefore, the daily intake requirements of B_1 must be figured on higher unit requirement. In the case of the mother, during the period of gestation, her requirements for this vitamin are only slightly in excess of those prior to conception In the period of lactation, however, her requirements may be tripled or quadrupled, for the reason that approximately 60% of the intake of this vitamin is destroyed during the process of milk formation and the further fact that she has her own bodily requirements to maintain plus that required in her milk by the rapidly growing litter.

As the daily intake requirements of the various nutritional factors are calculated on a definite unit of body weight plus the duty to be performed, it becomes obvious that the requirements per unit of body weight differ, depending upon whether they are in: (1) a state of maintenance; (2) growth; (3) reproduction; (4) lactation; (5) increased metabolism due to some disease processes, or (6) work. During the period from weaning to adulthood the puppy can be expected to increase in weight severalfold. This means that his daily intake of nutrient factors must keep pace with his growth. It can be seen, therefore, that the intake of nutrient requirements on a unit of body weight plus the work or duty performed is a yardstick which enables us to understand and meet the nutritional requirements of dogs throughout their life cycle.

■ With the knowledge of the requirements of the dog based on his weight and whether he is an adult dog in a state of rest or a growing puppy doubling his weight within a four-week period or a bitch nursing a litter of puppies, we are able to calculate with a fair degree of accuracy the requirements of the dog under varying conditions. One of the chief differences between standard and cheap dog food is: standard dog food uses this yardstick and formulates its product to comply with the requirements at the point of greatest stress and strain. Cheap dog foods make no attempt to meet the dog's nutritional requirements even at the point where the stress and stain is the least. One cannot tell from the label or advertisement whether any particular brand of dog food will meet the nutritional requirements even under the most favorable conditions. The poorest food often carries the most exaggerated statements and claims on the label and in the advertising. Neither can it be told by looking at the product. The price is perhaps one of the most reliable gauges as to the nutritive value of the contents of the can or bag of feed. It costs more to make a standard dog food that will meet the nutritive requirements of dogs than one that does not. It is possible for the foods that sell at standard prices to be nutritionally adequate. It is not possible for the cheap foods to be so.

When we go into the dry dog foods, we find a similar condition. Price again rules. A food containing corn meal, oat meal, alfalfa leaf meal, excessive amounts of beet and tomato pulp, bran or middlings, and a low grade of tankage can be sold for less than a standard dog food in meal form. If any dog owner believes that his dog can satisfactorily exist on food of this character, our recommendation is: buy a good grade of chicken mash. The average good laying mash made by a reputable manufacturer is a better formula and less expensive than the average similar product labeled "dog food." We are not recommending that dog owners do this for the reason that the coefficient of digestibility for the dog for such cow feed as corn meal, bran, or alfalfa leaf meal, is low indeed; and tankage makes a pretty good hog feed—if it is good tankage. For the dubious nutrition these raw-cereal, so-called dog foods provide the dog, they are many times more expensive per unit of nutrition, than any of the cooked cereal dog foods now on the market.

In the biscuit field there are available biscuits that differ little from the hardtack of the days of sailing ships except that they contain a little tankage. Such biscuits, if fed according to their manufacturer's recommendations, cannot fail to result in nutritional deficiencies. On the other hand, there are biscuits on the market which have been fed through several generations

to dogs, under most critical conditions and as an exclusive diet, without resulting in the slightest evidence of nutritional inadequacy. Between these extremes we have dog foods that can be classed just as so-so. Dogs will do fairly well on them under favorable conditions, but fail in times of stress.

For economical feeding, whether of canned dog food, a cereal meal, biscuits or kibbles, our recommendation is to feed the best. The best is usually made to meet the nutritional requirements of the dog, the poorest is usually made to meet the price demands of the uninformed. In all cases the best is the cheapest in the long run for the owner of the dog.

* * * *

Pentastoma Tenioides in Kansas

July 7, 1939, a client presented a fox terrier at the veterinary hospital of T. P. Crispell, Parsons, Kans., with the symptoms of frequent sneezing and a slight stringy discharge from the nostrils, which had persisted for some time.

Microsopic examination of the discharge revealed an unfamiliar parasite. A specimen was sent to J. E. Ackert at Kansas State College for identification. It was identified by Doctor Ackert as belonging to the group Pentastomida (Linguatulida), probably *Pentastoma tenioides (Linguatula rhinaria)*.

The Pentastomida are arthropods which have become extremely altered as a consequence of their parasitic mode of life, having a worm-like body and rudimentary mouth parts, and no legs in the adult. The adult form of *Pentastoma tenioides* infests the nasal cavities of mammals, usually the dog. The larvae infest the visceral organs of herbivorous animals. Dogs most commonly become infested by eating rabbits.

This parasite is quite common in many of the southern states, including the neighboring state of Oklahoma, but as far as can be ascertained, this is the first time it has been reported in Kansas.

C. H. KENNEDY, K.S.C. '40.
Manhattan, Kans.

Lymphatic Leucemia in a Hound

A five-year-old, black and tan, male hound was presented at the veterinary clinic of Kansas State College on December 27, 1939.

History.—During the latter part of September the owner had noticed an enlargement of the lymph glands of this dog, particularly the prescapular and the popliteal lymph glands. The swelling in these glands disappeared within a few days but reappeared every week or two with increased severity. During this time the dog suffered no ill effects from the disease and his appetite remained good.

On December 6th, 7th, and 8th the owner used the dog for hunting. For about a month before this hunt the dog had shown no signs of the disease but on the day following it appeared very much exhausted. The hounds, including this dog, were left to go home by themselves—a distance of probably ten miles. The other dogs in the pack were home the next day but this one did not appear with them.

December 25th the dog returned home.

Fig. 1. The patient when presented at the clinic.

He was greatly emaciated but had a good appetite. At this time the head was much swollen, especially in the submaxillary region and the popliteal and prescapular lymph glands were very prominent. A bulging of the abdomen such as is seen in ascites was noticed. Although the appetite was good the dog had difficulty in swallowing, no doubt due to the enlargement of the submaxillary and related lymph glands and the accompanying swelling of neighboring tissues.

The diet of the pack of hounds of which this dog was a member consisted chiefly of corn meal and what rabbits they caught.

Most noticeable of the symptoms when the dog was presented at the clinic was the greatly enlarged head, especially in the region of the submaxillary lymph glands (Fig. 1). On the left side of the head a soft spot was palpated over the region of the submaxillary glands. This pocket was tapped with a needle and was found to contain a greyish-white purulent material with a rather fetid odor. The area was shaved and disinfected, incised along the course of the needle and the pocket drained. The popliteal and prescapular lymph glands were greatly enlarged.

Palpation of the abdomen revealed a large, hard, somewhat pendulous mass of tissue.

The prognosis was unfavorable and at the owner's request the animal was detroyed. Euthanasia was accomplished by the intracardial injection of 40cc of a concentrated solution of magnesium sulphate and a post-mortem examination made.

The autopsy revealed the hard mass in the abdomen to be the mesenteric lymph glands (Fig. 2), which had attained a weight of 4½ pounds. They measured eleven by seven by four inches.

Other lymph glands showing marked neoplastic hypertrophy were the mediastinals, prescapular, popliteal and submaxillary. The submaxillary gland from which the pus had been drained contained a necrotic focus.

The spleen and liver appeared quite normal. Total blood cell counts were for red blood cells 6,325,000 (a moderate deviation from normal, which is 7,340,000), and for white blood cells 26,050 (double the normal number, which is 13,000).

Unusual in this case were the greatly enlarged mesenteric lymph glands and the fact that there was little or no change in the spleen, liver, and kidneys. Lymphatic leucemia appears more commonly in older dogs and runs a more or less chronic course.

Fig. 2. The enlarged mesenteric lymph glands.

DALE L. CHERRY, K.S.C. '40.
Redwood Falls, Minn.

Sulfanilamide for Strangles

In experiments on mice and horses, Descazeaux and Courtade found that sulfanilamide completely protected mice against experimental infection with *Streptococcus equi*, and that when used at an early stage in the treatment of strangles in horses, rapid cures were obtained. When used later, particularly after the formation of pulmonary abscesses, it was much less efficacious. They advocate administering the drug by mouth at the rate of 0.045gm per pound of body weight (about 50gm for a horse of average weight), once a day for at least six days.

Inguinal Hernia in a Dog

A six-year-old female toy terrier weighing five pounds was presented for examination because of inactivity and loss of appetite. She had had two litters of puppies, but according to the owner was not pregnant at the time; however, he owned a male of the same breed.

Examination revealed a double inguinal hernia; in the left hernia, near the internal ring, a round, smooth, solid lump the size of a walnut was palpated. There was some milk in the udder and the dog was slightly uneasy.

Vaginal examination revealed a black, malodorous placenta, and a shrunken, headless pup which was removed readily with a bond placenta forceps. The pup had been dead for some time, but the neck was freshly broken. It was believed that the head of the pup was the lump in the left inguinal hernia.

Operation.—One grain of morphine sulphate was administered subcutaneously and anesthesia was completed with ether. By deep palpation another pup was located in the abdomen. Both sides and flanks were shaved and disinfected. A number of Jones towel forceps were used to cover the skin area with sterile towels. A skin incision just above the mammary gland was made to avoid a troublesome milk fistula. An Allston mastoid retractor was applied to the skin incision. A Mayo scissors with removable edges was used to open the body cavity for the operation; the scissors were closed, the points forced a short distance into the tissue, then opened and the tissue torn apart until the hernia sac was visible. (It is necessary to repeat this procedure many times, but when the opening is made in this manner the area does not become covered with blood, and it is possible to see what one is doing.) When a blood vessel appeared in the foreground it was laid entirely bare by the tearing process and ligated on both ends of the wound, snipped off, and the section removed. The hemorrhage was so slight that no method of controlling it was necessary.

The hernial sac was isolated and incised, and the uterus brought forth. It was a normal pink color with no evidence of necrosis. It was incised and the head of a pup removed. An odorless, semi-liquid black material was removed with sterile swabs. The uterus was then sutured with an atraumatic needle and chromic 20-day No. 00 catgut, musoca to musoca and serosa to serosa, and returned to the abdominal cavity, with some difficulty because of the location of the incision.

A Ferguson angiotribe forceps was applied to the empty hernial sac close to the internal ring, and the sac was sutured with chromic 20-day No. 1 catgut between the forceps and the body by means of multiple sutures, leaving two long ends. The sac was then amputated about one inch distal to the sutures. The cut edges were then sutured with catgut, and the stump of the sac returned through the hernial opening into the peritoneal cavity. The two long ends of the catgut were held with forceps. One end of the suture was threaded into a round needle; this was inverted and the eye end of the needle pushed through the abdominal wall anterior to the hernial ring. This piece of suture was held with forceps while the long end around the stump was passed through the abdominal wall in the same way, and the ends were tied. The area was then covered with a sterile cloth.

The dog was turned over and the right inguinal hernia operated upon in the same manner (except that it contained no viscera) and the area covered with a sterile cloth. The animal was then turned over again and, leaving an island of skin about one inch wide, another skin incision was made in the flank for a cesarian section. (The left side was selected because it was thought that the pup was in the left cornu; it proved, however, to be in the right cornu.) The points of the scissors were used to separate the areolar tissue. The muscle fibers of the obliquus abdominis externus were laid bare and an opening made longitudinally in the direction of the fibers. The same procedure was carried out with the transversus abdominis muscle. The peri-

toneum was picked up, punctured with the scalpel, and the opening enlarged with the scissors. The uterus was brought to the surface, punctured over the pup, and the opening enlarged with the scissors. The dead pup and some semi-liquid black material were removed. The uterus was sutured and returned. The peritoneum and muscles were sutured with chromic 20-day No. 1 catgut, and the skin with linen sutures.

The dog was placed in a small cage which was set over the furnace register in the living-room and kept warm. The next morning 0.5cc of posterior pituitary extract was given subcutaneously.

The operation consumed two hours, but the tiny patient made a complete recovery without complications.

This report illustrates the advisability of using the scissors more in operations, and the scalpel less. The reason for this is that the loss of blood is less with the scissors—an important point, since loss of blood has a depressing effect, augments shock, impedes regeneration, and opens the door to possible complications.

CHARLES H. HAASJES.

Shelby, Mich.

* * * *

Meat Inspection

At the request of the City Council official meat inspection has been established (1939) at Missoula, Mont. Under the order promulgated by the Montana Livestock Sanitary Board it is required that all meat food products sold or offered for sale at Missoula or within a radius of ten miles within all directions of the city limits must have passed an official meat inspection and be stamped with an official stamp certifying to its fitness for human food.

There is a growing demand for meat inspection, not only in Montana but throughout the entire United States. It is now a well-known fact that the physical fitness of a people and the mental happiness of the human being as well as their resistance to disease is dependent upon proper nutrition. Every citizen is entitled to know that the food that he purchases is free from disease and fit for human consumption.—*Annual Rept. Montana Livestock Sanitary Board.*

* * * *

Vaccine From Incubating Eggs

The discovery within recent years at Vanderbilt University that the incubating egg may be used in propagating the viruses which cause certain animal diseases, has given scientists of the Federal Bureau of Animal Industry an effective weapon for fighting some of the most baffling plagues of live stock.

Already the developing embryos are used in making vaccines for such diseases as pox of birds, encephalomyelitis, and laryngotracheitis of poultry. Preliminary research also shows promising results in developing vaccines for vesicular stomatitis. horse and swine influenza, dog distemper, cat distemper (feline infectious enteritis), rabies and pseudo rabies.

The embryo of the incubating egg, secure within its sanitary shell, develops healthily and until it pips the shell it is reasonably safe from diseases that pester it from hatching time onward. Thus its sterile abode during the incubating period, and not any pre-immunity to disease, gives protection until hatching time.

This same shell, bureau scientists point out, makes the embryo an ideal host to the virus because it insures against outside contamination. The mechanics of the process are fairly simple. After the egg has been in the incubator for nine to 11 days, it is removed for the virus injection. The virus "grows" until the embryo is killed or develops characteristic lesions which vary with the type of virus.

In the manufacture of equine encephalomyelitis vaccine, with the incubating egg injected with virus at 11 days, the embryo usually dies in about 16 hours. It is not unusual for an egg to develop as much as 5,000,000 or more m.l.d.'s per gram of weight.

Peafowl*

By F. W. HANSEN, JR., Manhattan, Kan.
Kansas State College, Class of 1940

Historical

Ancient writers of the Roman period recorded, very fluently and authentically, data on peafowl. At that time the royal bird was a delicacy on the banquet table as well as an ornamental bird.

The peacock has long been a figure in folk-lore and many legends and superstitions about him have been handed down to the present. Notable among these is the superstition concerning the evil eye of the peacock's train. God was supposed to have cursed the seven sins by taking their eyes and putting them in the ocelli of the male bird's plumage. Since that time sins are supposed to have followed the peacock in quest of their eyes, hence the common belief of bad luck associated with the eye in the peacock's feathers.

Peafowl have also taken their place in empiric medicine. The Singhalese pharmacopeia states that the peacock is a cure for rheumatism. The ocelli are supposed to be an antidote for snake bites, and the crest, or top knot, if ground to a powder, is supposed to be very salubrious.

Classification

Peafowl fall into two distinct species, the Indian and the Javan. The Indian or blue peafowl, *Pavo cristatus,* is the more common species and is more adaptable to semi-domestication. There are two color varieties of Indian birds, the japanned and the white. The former has a more golden back, a deeper purple tail, and the wing coverts are blue.

The green or Javan peafowl, *Pavo muticus,* is a slightly smaller and less hardy bird than the common peafowl. The back of this bird is green edged in blue. This species does not lend itself to domestication and is but rarely seen in captivity. Their belligerent habits make them disagreeable and even dangerous.

Peahen eggs are slightly larger than turkey eggs, weighing about 90gm. They are of a slightly tinted white color, not mottled or speckled.

The eggs can be artificially incubated, but it is better to employ a foster mother, preferably a turkey hen. However, unless one is raising peafowl as a business, it is better to allow the peahen to build her own nest, and hatch the single clutch of eggs. The period of incubation is 28 to 30 days. The peahen is a very careful and conscientious mother until the slow-growing chicks have attained their growth, which requires about a year.

The peafowl objects to confinement, although it will remain in one locality throughout life. It can fly with ease and grace. Both breeds are tropical fowl, but the common breed quickly adjusts itself to more moderate climates. The male bird is very vain and when he has an audience will display his plumage for hours at a time, seeming to enjoy it as much as those watching. When he molts in the late summer he seeks seclusion until his train has grown out again by the end of the winter.

Husbandry

Breeding is usually performed in the warm summer months. The male does not reach sexual maturity until he is three years old, and the female is two years old before she lays eggs. The first year the hen usually lays two eggs, and increases this number one or two eggs a year until she is laying from five to nine eggs a year. Inten-

*The author wishes to acknowledge the help and coöperation of Prof. L. F. Payne of Kansas State College in compiling this article.

sive production methods can be applied here by collecting the first clutch of eggs; the hen then will lay a second and sometimes a third clutch.

The peacock is a lusty bird, suited to take care of a harem of from three to five hens. Where raising peafowl as a business is practiced, it is the best plan to allow each male his individual harem, and to keep them separated.

The feeding of the peafowl is a problem of minor importance as they are very efficient at foraging for themselves. However, should insects or other natural food be scarce, or if the birds are confined, a mixed ration should be supplied. Young chicks are quickly taught to eat grain, millet seed being the best starter grain. Whole corn or barley makes a good diet for older birds. In addition, it is advisable to keep a green vegetable feed in front of the birds, and necessary to keep grit, crushed oyster shell, and water available.

Peafowl are often advertised as being acclimatized to a certain locality. Since the birds are tropical fowl, it is natural to assume that colder climates would be adverse to their well-being. In part, this is true of the more delicate green peafowl. This bird must be housed during winter months in a temperature of 50° to 65° F. However, the semidomesticated Indian bird is very hardy and will become acclimatized to colder localities if supplied with a dry, windproof shelter for the winter.

Handling

Peafowl are timid birds, easily frightened. When approaching them, move slowly and coax them in a soft tone of voice. In a short time the birds will become quite accustomed to the presence of persons and the male will display his plumage freely. The birds may even be taught to eat from the caretaker's hand.

Shipping the birds often presents a problem that, at first, looks difficult. However, by constructing a crate that is long enough for the bird, and too narrow for him to turn around and break his feathers, the shipping problem is easily solved. It is well to wrap the plumage of the male in some heavy cloth, such as burlap, to protect it.

When new birds are brought in, it is well to keep them confined for a few days to prevent their straying. After being confined for five or six days the birds may be turned at liberty, as they will remain about the premises.

Disease Conditions

The individual diseases of peafowl have been little studied. It has been assumed that the disease problems of peafowl husbandry are very similar to those encountered in turkey raising; that peafowl are susceptible to pullorum disease, tuberculosis, fowl cholera and typhoid. Blackhead has been definitely reported in peacocks. By virtue of their daintier habits, the peafowl are, perhaps, a little less apt to contract disease than turkeys. Birds that are allowed sufficient room on clean soil, with clean, sanitary shelters, should be little troubled with disease.

It is well to note that the critical period in the life of a peacock is from hatching until it reaches the age of six to seven weeks. During this time death may result from fatigue from following the mother bird, or from overexposure in damp grass, or from chilling. It is best to keep the peahen confined until the topknot appears on the chicks. At this age the young birds are strong enough to follow the peahen.

Loses occasionally occur from bronchitis and pneumonia in birds that are not properly housed during the winter months. A dry, windproof shelter house is all that is required for prevention. Such a shelter may be constructed of sheet metal or wood. A three-sided affair, eight to ten feet long and about six feet wide, open exposure on the south, is a suitable house for two adult birds. The birds are noisy when mating.

At the present time peafowl are selling for about $18.00 to $20.00 a pair. They are graceful, quick, and alert, and make a magnificent ornament on any premises; and peafowl are a very choice food, too. It is not beyond the range of possibility that peafowl raising may grow into an important branch of poultry husbandry.

The Effects of Repeated Anesthetic Doses of Sodium Amytal and Sodium Barbital*

By R. HAFKESBRING, E. GREISHEIMER and H. MAGALHAES

Department of Physiology, Woman's Medical College of Pennsylvania, Philadelphia, Pennsylvania

THE purpose of this investigation is to continue the study of the effects of repeated doses of the barbiturates on blood pressure, heart rate, respiration, body temperature, urea and creatinine clearances, hemoglobin, red and white cell counts. In this paper, the results of the use of sodium amytal and sodium barbital are presented.

Eighteen series of experiments on four female adult dogs were performed using sodium amytal, and five series of experiments on two female adult dogs using sodium barbital.

The diet used was Cero-Meato. Three of the dogs gained on this diet, two remained about the same and one lost slightly.

The routine was to establish a normal for each animal. The number of controls for each animal varied from 4 to 15. Dogs C, D, K and L were used for the sodium amytal studies, and dogs F and M for the sodium barbital. After the control period, each animal was given the anesthetic at intervals of approximately two weeks. Surgical anesthesia was maintained for one hour by the use of 0.042-0.055gm per kg of body weight of sodium amytal (Lilly) or 0.148gm per kg of sodium barbital (Merck). The anesthetic was dissolved in physiological saline solution and injected intraperitoneally.

Three or four complete sets of experiments were performed between periods of anesthesia. The results obtained with sodium amytal are shown in Table I and those obtained with sodium barbital in Table II.

Discussion

Sodium Amytal.—The most marked effect was on heart rate. Respiratory rate decreased slightly in two cases and increased considerably in two. Every effort was made to keep the body temperature constant, so very little change in this respect was noted.

Blood pressure was determined by the Allen method[1]. In two dogs, there was a slight decrease in systolic pressure and in two a slight increase. In one dog, the diastolic pressure remained constant, in two dogs there was a slight decrease and in one dog a slight increase. These variations were noted during the periods of anesthesia.

Kidney function was studied by determinations of urea clearance (Van Slyke Method[2]), and creatinine clearance (Holten and Rehberg[3]). One and one-half to two grams of creatinine, depending upon the weight of the animal, were given by stomach tube in 200cc of 0.3% sodium chloride solution.

The figures given under creatinine clearance are the number of cubic centimeters of blood cleared of creatinine in one minute. The figures given under urea clearance are the number of cubic centimeters of blood cleared of urea per square meter of body surface in one minute.

Sodium amytal does not appear to have a constant effect on either the urea or the creatinine clearances. As shown in the table, the effects in the four animals differ. In every case, there was an increase in the creatinine clearance on the day following the anesthesia. The creatinine clearance of dog C remained high for one week after the anesthesia, then fell below the control level. In Dog D, the creatinine clearance did not return to the control level, but remained high during the entire period of the study. In dog K, it decreased within a week after the anesthetic was given, but

*Aided by grants from the Penrose Fund of the American Philosophical Society, and the Committee on Therapeutic Research, Council on Pharmacy and Chemistry, American Medical Association.

[1] *Jour. Med. Res.*, 1923, 4, p. 431.
[2] *Jour. Biol. Chem.*, 1933, 102, p. 489.
[3] *Acta Med. Scan.*, 1930-31, 74, p. 479.

rose again within a period of two weeks to a level almost as high as on the day following the anesthesia. In dog L, the creatinine clearance returned approximately to the normal level within one week, and fell below this in the second week after the anesthesia.

TABLE I.—Results Following Use of Sodium Amytal

	Blood Pressure		Respiration	Temperature	Heart Rate	Creatinine Clearance (cc/min)	Urea Clearance (cc/sq.M/min)
	S	D					
				Dog C (5)			
C	174	67	20	100.5	97	65.93	68.9
1	172	60	20	100.1	74	81.71	68.9
6-9	173	58	25	100.7	98	81.42	61.9
14-15	171	59	21	100.8	99	53.07	66.4
20-55	171	58	25	100.7	96	53.49	65.5
A	164	60	17	100.1	165	——	——
				Dog D (7)			
C	176	68	25	100.5	89	49.36	50.4
1	176	63	33	101.2	131	60.19	62.5
6-8	176	60	30	100.5	89	58.81	45.8
13-15	177	61	31	101.1	116	64.42	47.5
A	170	63	42	100.9	185	——	——
				Dog K (5)			
C	167	61	27	100.9	88	57.04	64.3
1	177	58	25	100.1	86	82.36	72.9
7-9	177	60	29	101.1	89	66.44	80.7
13-15	177	59	27	100.9	90	80.61	72.8
A	172	60	23	100.4	185	——	——
				Dog L (1)			
C	162	59	16	102.2	94	54.31	71.7
1	172	54	16	100.7	88	62.99	49.8
8	168	54	22	101.4	84	56.05	64.3
14	172	58	20	101.0	82	48.49	56.6
A	165	68	30	101.3	168	——	——

In dog C, the urea clearance remained unchanged the day after the administration of the anesthetic. In dogs D and K, there was an increase and in dog L, there was a decrease, In dog C, one week later, there was a decrease. Following this, the tendency was upward toward the control level. In dog D, one week later, there was a marked decrease. This remained below the control level during the second week after the anesthesia. In dog K, urea clearance reached a still higher level one week after the anesthesia and in two weeks had not yet returned to the control level. In dog L, the urea clearance rose again during the first and second weeks, but did not return to the control level.

Sodium Barbital.—The heart rate increased during the anesthesia. This increase was not as great as with sodium amytal. The respiratory rate increased slightly in each case during the anesthesia. There was practically no change in body temperature because of the efforts made to keep it constant. In one dog, the systolic blood pressure increased and in the other, it decreased during the anesthesia. The diastolic pressure increased slightly in both.

Creatinine clearance increased in dog F and decreased in dog M on the day following the anesthesia. In dog F, the creatinine

TABLE II.—Results Following Use of Sodium Barbital

	Blood Pressure		Respiration	Temperature	Heart Rate	Creatinine Clearance (cc/min)	Urea Clearance (cc/sq.M/min)
	S	D					
				Dog F (3)			
C	165	60	24	101.1	97	42.91	60.6
1	174	65	32	100.5	97	64.04	46.5 (2)
6-8	173	59	31	100.9	89	72.15	52.5
13	176	59	26	100.6	94	93.26	51.1
22-27	167	59	26	100.6	92	88.93	50.9
A	172	66	30	100.3	117	——	——
				Dog M (2)			
C	166	59	17	100.4	84	52.28	59.8
1	166	58	25	100.2	84	35.90	61.8
7	182	78	20	101.0	84	39.90	62.3
14	180	76	20	100.6	88	40.69	51.4
A	156	61	29	100.7	104	——	——

C—Average of controls before any anesthesia.
1—Average of results the day after anesthesia.
6-8—Average of results 6-8 days after anesthesia.
13-14—Average of results 13-14 days after anesthesia.
22-27—Average of results 22-27 days after anesthesia.
A—Average of determinations during anesthesia.

TABLE III.

	Hb	RBC	WBC
		Dog C (5)	
C	9.52	5.70	11.11
1	9.50	6.67	16.72
6-9	10.18	6.78	11.80
14-15	9.91	6.86	11.60
20-55	10.58	7.10	12.26
		Dog D (7)	
C	10.72	7.27	11.42
1	12.12	8.24	12.40
6-8	12.17	8.42	11.06
13-15	12.39	8.62	11.91
		Dog K (5)	
C	10.59	7.28	17.06
1	9.22	5.92	17.39
7-9	9.73	6.46	16.69
13-15	9.65	6.22	16.35
		Dog L (1)	
C	11.12	7.38	10.22
1	12.28	7.01	11.80
8	12.17	7.43	10.40
14	12.05	8.01	8.40
		Dog F (3)	
C	9.87	6.80	9.70
1	9.31	6.35	9.32
6-8	9.86	6.95	8.52
13	10.28	6.39	10.95
22-27	9.80	6.10	8.78
		Dog M (2)	
C	11.10	7.82	14.60
1	9.77	6.23	20.40
7	9.64	8.78	11.20
14	9.71	7.94	16.90

Hb in grams/100cc.
RBC in millions/c.mm.
WBC in thousands/c.mm.

clearance increased steadily, reaching its highest level two weeks after the anesthesia. In dog M, the creatinine clearance level was below the control level two weeks after the anesthesia.

The urea clearance decreased in dog F the day after the anesthesia, and increased very slightly in dog M. In dog F, there was a slight increase one week later, which continued, but had not yet come up to the control level at the end of four weeks. In dog M, urea clearance dropped below the control level two weeks after the administration of the anesthetic.

The results of the blood studies are shown in Table III. There seems to be no significant change in the hemoglobin (Newcomer[4]) and total cell counts that can be attributed directly to the anesthetic used. The fluctuations that do occur are within the normal range and are no greater than the variations between the normal values obtained during the control periods.

[4] *Jour. Biol. Chem.*, 1919, 37, p. 465.

Botulism in a Cat

A case of botulism was recently diagnosed in a cat in the vicinity of Philadelphia.

A tenant farmer's wife opened a can of corn which she had prepared by the cold pack method. Finding it spoiled she emptied it into the garden, where it was discovered and eaten by the family cat and six chickens. Soon after this the cat showed depression, which passed into general paralysis and finally death. The chickens showed typical symptoms of botulism (limberneck) and died. The post-mortem findings in all cases were negative.

From the attending circumstances, the typical symptoms and the absence of post-mortem findings it seems that one is justified in considering these cases of botulism even though neither botulinus organisms were recovered nor botulinus toxin demonstrated.

JOHN D. BECK.

Philadelphia, Pa.

Auralgan in Aural Hygiene

In the rural districts, although canine practice is not large, we have pets and gun dogs and barking guardians of the home that get quite as much attention as the swankiest poodle of the city apartment-dweller. While their ailments may not be as numerous as the infirmities of the over-fed, underexercised victims of urban corrals, there are broken legs, mangy skins, distemper, and just plain sore ears which bring them forthwith to the veterinarian's office. One difference between the small-town dog and the big-town dog lies in the reality of their troubles. When a country dog is brought to a veterinarian there is something the matter with him, always. The mysterious malaises of one kind or another about which so many pages are written never reach us. Outdoor life and mixed dietary probably avert the minor troubles, which are unimportant or more or less imaginary.

Recently, I had occasion to see a valuable dog suffering from a severe otitis, the picture of agony. I thought of auralgan, a new preparation recently recommended to me. A small amount instilled in the auditory canal brought instant relief. The dog, previously in great pain, went to sleep, and the client was so highly pleased that she hauled right off and paid me for the call! When I recovered from the shock, I made a mental note to change my former treatment of ear canker.

R. C. FINKLE.

Seymour, Wis.

Vitamin B_1 (thiamin chloride) is essential wherever carbohydrates are broken down. As Patton has shown, a dog's B_1 requirement on a high carbohydrate diet is several times as great as on a high protein diet. Thus skim milk and meat generously used in a dog's ration, prevent the development of fright disease, not so much by the vitamin B_1 they supply as by lessening the need for it for carbohydrate metabolism. The abundant occurrence of B_1 in yeast is not an accident. It is required for the action of yeast in reducing sugars to alcohols.

Abstracts

The Genesis of Sidebones

Müller [9] examined the feet of horses before and after slaughter and studied closely 41 lateral cartilages. In 17 cases the cartilages had become more or less ossified, the process starting at the point of attachment to the third phalanx, and in 10 cases there were ossification centers in the cartilage remote from the point of attachment. With regard to pathogenesis it was observed that the ligaments of the lateral cartilage exert traction on the cartilages when the pastern is at a steep angle with the ground; this evidently causes some irritation at the junction of cartilage and ligament and it is there that ossification commonly starts. The cause of isolated ossification is obscure.

* * * *

Paratyphoid Abortion of Mares

In the years 1932-33 there was an epizoötic of *Salmonella abortus-equi* infection among the horses in the Ajoie district of Switzerland, animals of all ages and both sexes being attacked.[10] The symptoms were fever, weakness, and anemia, with in some cases complications such as tendo-vaginitis, with of course abortion in the mares. Altogether at least 150 mares (20% of the pregnant mares of the district) aborted. Fifty-three out of 69 samples of material from fetuses, fetal membranes, etc., contained almost pure cultures of *S. abortus-equi*. Ninety-two out of 158 samples of blood (57.8%) agglutinated *S. abortus-equi* in a dilution of 1:100. The cultures obtained from the mares and from uterine exudate were uniform in their serological properties; those obtained from the fetuses varied greatly in sugar utilization. Cultures obtained from anemic animals hemolyzed horse-blood agar in 24 hours. This strain of *S. abortus-equi* was pathogenic for mice. From control experiments it was proved that animals with a blood titre of 1:100 and higher can be regarded as infected or as carriers. No treatment was attempted.

[9] Müller, E., 1939. Ueber den Beginn der Hufknorpelverknöcherung. *Tierärztl. Rdsch.* 45, pp. 90-92. Abst. by V. Chládek in the *Vet. Bul.*, 9:12, p. 873.

[10] Saxer, E., 1938. Untersuchungen über die Abortussalmonellose der Pferde in der Ajoie. *Schweiz. Arch. Tierheilk.* 80, pp. 137-155 and 198-211. Abst. by A. W. Möller in the *Vet. Bul.*, 9:12, p. 824.

* * * *

Equine Influenza

Under peace-time conditions equine influenza is usually not very prevalent, but in war-time it may assume formidable proportions owing to the concentration of large numbers of animals in small areas.[12] Horses which contract the disease under favorable conditions of health and environment vary somewhat in their reactions, but serious complications are very rare. On the other hand, cases which arise in unfavorable circumstances such as in the course of shipping, on lengthy train journeys, or during adverse climatic periods, are usually complicated by pneumonia or other sequelae. The period of convalescence depends largely on the previous condition of the animals. Well-conditioned, acclimatized horses in India have recovered in two or three weeks, while newly-landed animals required six to 12 months before they were fit for service.

In the field the most successful method of dealing with the disease appears to be complete cessation of all work in infected units, with entire rest during the pyrexia stage. The animals are allowed to remain at liberty in paddocks, but are strictly isolated. After severe symptoms subside they are walked on the lead and subsequently if they can be trotted without coughing they are gradually returned to work. Fast work early predisposes to strains and roaring and is therefore to be avoided. In the benign type of the disease the policy of mixing infected and non-infected animals is justified, and is probably the best way of reducing the duration of an outbreak to a minimum.

Recently the intravenous injection of 3gm of neosalvarsan in 60cc of distilled water has given excellent results in the medicinal treatment of severe cases.

[12] Todd, A. G., and J. J. M. Soutar, 1939. Influenza. Rep. 13th Int. Vet. Cong. 2, pp. 1202-1213. Abst. by D. D. Ogilvie in the *Vet. Bul.* 9:12, p. 872.

Protection of Horses from Poison Gas

In experiments carried out in Holland [14] horses were found to be at least as susceptible as man to the effects of mustard gas, with the difference, however, that instead of causing blisters the gas produced necrosis in the skin. The feet and hoofs were found to be sufficiently protected from the gas by the thick hair and horny layers. Tear and nose-irritant gases appeared to have very little effect on the horses. The technical difficulties inherent in the construction of a satisfactory gas mask for horses are briefly discussed.

* * * *

Navicular Disease of Horses

From numerous examinations of the feet of horses selected at random after death, Westhues [11] found that degenerative changes on the deep surface of the navicular bone and on the opposed surface of the deep flexor tendon are very common in horses from eight years of age upwards. The change starts on the surface of the tendon, which in the early stage shows a change of color, a loss of transparency of the surface layer, and later small erosions and exposure of the tendon fibers. Microscopically the cells of the tendon tissue show lipoid degeneration and necrosis.

The navicular bone becomes affected secondarily and shows similar changes. The condition is called podotrochlosis, and it is essentially degenerative and not inflammatory. Inflammation, as opposed to the degenerative surface changes referred to above, occurs only in the deeper parts of the tendon and navicular bone when the podotrochlosis is advanced.

Westhues believes that podotrochlosis is the result of overburdening of the forelegs; it occurs chiefly in riding horses.

[14] Parree, W., 1937. Mededeeling over den stand van het vraagstuk "gasbescherming van paarden" in het K. N. I. L. *Ned.-ind. Bl. Diergeneesk* 49, pp. 263-276. Abst. in the *Vet. Bul.*, 9:12, p. 900.

[11] Westhues, M., 1938. Ueber das Wesen, die Diagnostik und die Therapie der Podotrochlitis chronica des Pferdes. *Berl. Münch. Tierärztl. Wschr.*, Dec. 23, pp. 781-785 and Dec. 30, 797-802. Abst. by V. Chládek in the *Vet. Bul.*, 9:12, p. 873.

Equine Periodic Ophthalmia

Mintschew [13] suggests the theory that periodic ophthalmia is caused by intoxication by histamine or by an agent with a comparable action present in the blood of affected horses. He states that he set up the disease in horses by an intra-arterial injection of histamine. He considers that it is possible that histamine is produced in some way by digestive derangement, and suggests that laminitis may be a manifestation of histamine poisoning. He advocates a method of prevention depending upon periodic dosage with lactic acid and pilocarpine.

* * * *

The Duration of Pregnancy

There is much evidence that not only parturition but also other critical phases of embryonic life, *e.g.* ovulation, fertilization, transport of the ova and implantation, are under hormonal control.[18] Certain manifestations of the sexual cycle occur during pregnancy in different species, and it is suggested that the length of gestation is approximately a single multiple of the cycle. Normal parturition involves two types of changes, namely (1) muscular—an increase in the contractility of the uterine muscle, and (2) decidual—separation of the placenta. These can be dissociated experimentally.

In the horse, ovulation occurs in the early stages of pregnancy, markedly increasing the luteal tissue present in the ovaries; later the corpora lutea regress. During the early stages of pregnancy the blood of the mare contains large quantites of gonadotropic hormone. In the cow the Graafian follicles may attain their full size and there are many atrophic follicles present in the ovary during gestation; estrus and mating occasionally occur at almost all stages of pregnancy. Evidence of a follicular rhythm during pregnancy is also found in the guinea pig and the rat. There is also evidence of

[13] Mintschew, P., 1938. Ueber die Aetiologie, Therapie und Prophylaxe der Mondblindheit. *Tierärztl. Rdsch.* 44, pp. 748-753 and 761-769. Abst. by V. Chládek in the *Vet. Bul.*, 9:12, p. 872.

[18] Snyder, F. F., 1938. Factors concerned in the duration of pregnancy. *Physiol. Rev.* 18, pp. 578-596. Abst. by J. M. Robson in the *Vet. Bul.*, p. 902.

abortive menstrual cycles in the monkey and the human subject.

Differences in the gestation periods of different breeds of rabbits are dependent upon hereditary factors, and the same is true for different breeds of horses. Variations in the gestation periods of a species are such that the average gestation period may approximate a multiple of the cycle, the series of pregnancies under consideration including extreme cases which range from the beginning of viability to the end of the period of post-maturity of the fetus.

* * * *

Milk Regulations in Portugal

Three designations of milk are recognized in Portugal: (1) ordinary milk, *i.e.*, milk produced from healthy cows and satisfying certain conditions relating to fat content, absence of coloring matter and pathogenic organisms, etc.; (2) pasteurized milk, *i.e.*, milk which after pasteurization satisfies the requirements relating to ordinary milk, and (3) special raw milk, *i.e.*, milk which besides satisfying the requirements relating to ordinary milk, is produced under certain conditions specified by law.[20] Cows intended for the production of milk in this last category must be previously approved and receive permanent veterinary attention. They must be housed away from densely populated areas, and there must be separate accommodations for milking. A cold storage room must be provided where milk may be kept at a temperature not exceeding 7° C., and the temperature during the sale and distribution of this milk must not exceed this figure. A sample of the milk produced each day is required to be kept for 24 hours. The personnel of the establishment must be healthy and be subject to regular medical attention.

All producers of milk must be licensed by the Municipal Veterinary Officer in accordance with instructions laid down by the Director General of Veterinary Services. Byres must conform with regulations regarding accommodation and structure. Cows whose milk appears constantly unfit for human consumption may not be used for milk production and, if not slaughtered, must be branded. Pasteurization centers are to be established throughout the country and at some future date the sale of unpasteurized milk, except the special raw milk, will be forbidden.

[20] ————, 1938. Loi sur la production du lait alimentaire. *Bol. Pec., Lisboa* 6, pp. 67-83. Abst. by H. V. Hughes in the *Vet. Bul.*, 9:12, p. 887.

* * * *

Anthrax in Mink

Deaths from anthrax among mink bred for the fur are not infrequent since the animals are commonly fed on raw beef from rendering plants. Details are given [17] of six outbreaks in England in 1938 in which 320 mink out of a total of 1,290 were proved or presumed to have died of anthrax. In one small outbreak the onset of clinical anthrax in females with latent infection was occasioned by skin abrasions during mating. There is possible danger of human infection from scratches and bites by these animals. It is concluded that the pickling of skins (in tanning as usually practiced) is a sufficient safeguard to human beings wearing mink fur.

* * * *

Deaths Caused by Domestic Animals in Germany

Official records for the period 1926-1934 show that the annual number of accidents to human beings caused by domestic animals fluctuated between 298 and 417.[19] By far the largest number of these fatalities were caused by horses and cattle (65.9% and 29.8% respectively), other domestic animals being responsible for only 3.5% of the total. A remarkable feature was the very small number of veterinarians involved; during the whole period under review only three received fatal injury, and of the 975 practitioners who answered a questionnaire only 186 reported having suffered from more or less serious occupational accidents.

[17] Greener, Averil W., 1939. Anthrax in milk (*Mustela vison*). *J. Hyg., Camb.* 39, pp. 149-153. Abst. in the *Vet. Bul.*, 9:12, p. 815, by F. C. Minett.

[19] Habernoll, A., 1938. Die Haustiere als Ursache von Unfällen in Deutschland unter besonderer Berücksichtigung der Berufsverletzungen der Tierärzte Preussens. *Berl. Munch. Tierarztl. Wschr.* July 1, 393-395, and July 8, 407-410. Abst. in the *Vet. Bul.*, 9:12, p. 904.

Protection of Horses from Poison Gas

In experiments carried out in Holland [14] horses were found to be at least as susceptible as man to the effects of mustard gas, with the difference, however, that instead of causing blisters the gas produced necrosis in the skin. The feet and hoofs were found to be sufficiently protected from the gas by the thick hair and horny layers. Tear and nose-irritant gases appeared to have very little effect on the horses. The technical difficulties inherent in the construction of a satisfactory gas mask for horses are briefly discussed.

Navicular Disease of Horses

From numerous examinations of the feet of horses selected at random after death, Westhues [11] found that degenerative changes on the deep surface of the navicular bone and on the opposed surface of the deep flexor tendon are very common in horses from eight years of age upwards. The change starts on the surface of the tendon, which in the early stage shows a change of color, a loss of transparency of the surface layer, and later small erosions and exposure of the tendon fibers. Microscopically the cells of the tendon tissue show lipoid degeneration and necrosis.

The navicular bone becomes affected secondarily and shows similar changes. The condition is called podotrochlosis, and it is essentially degenerative and not inflammatory. Inflammation, as opposed to the degenerative surface changes referred to above, occurs only in the deeper parts of the tendon and navicular bone when the podotrochlosis is advanced.

Westhues believes that podotrochlosis is the result of overburdening of the forelegs; it occurs chiefly in riding horses.

[14] Parree, W., 1937. Mededeeling over den stand van het vraagstuk "gasbescherming van paarden" in het K. N. I. L. *Ned.-ind. Bl. Diergeneesk* 49, pp. 263-276. Abst. in the *Vet. Bul.*, 9:12, p. 900.

[11] Westhues, M., 1938. Ueber das Wesen, die Diagnostik und die Therapie der Podotrochlitis chronica des Pferdes. *Berl. Münch. Tierärztl. Wschr.*, Dec. 23, pp. 781-785 and Dec. 30, 797-802. Abst. by V. Chládek in the *Vet. Bul.*, 9:12, p. 873.

Equine Periodic Ophthalmia

Mintschew [13] suggests the theory that periodic ophthalmia is caused by intoxication by histamine or by an agent with a comparable action present in the blood of affected horses. He states that he set up the disease in horses by an intra-arterial injection of histamine. He considers that it is possible that histamine is produced in some way by digestive derangement, and suggests that laminitis may be a manifestation of histamine poisoning. He advocates a method of prevention depending upon periodic dosage with lactic acid and pilocarpine.

The Duration of Pregnancy

There is much evidence that not only parturition but also other critical phases of embryonic life, *e.g.* ovulation, fertilization, transport of the ova and implantation, are under hormonal control.[18] Certain manifestations of the sexual cycle occur during pregnancy in different species, and it is suggested that the length of gestation is approximately a single multiple of the cycle. Normal parturition involves two types of changes, namely (1) muscular—an increase in the contractility of the uterine muscle, and (2) decidual—separation of the placenta. These can be dissociated experimentally.

In the horse, ovulation occurs in the early stages of pregnancy, markedly increasing the luteal tissue present in the ovaries; later the corpora lutea regress. During the early stages of pregnancy the blood of the mare contains large quantites of gonadotropic hormone. In the cow the Graafian follicles may attain their full size and there are many atrophic follicles present in the ovary during gestation; estrus and mating occasionally occur at almost all stages of pregnancy. Evidence of a follicular rhythm during pregnancy is also found in the guinea pig and the rat. There is also evidence of

[13] Mintschew, P., 1938. Ueber die Aetiologie, Therapie und Prophylaxe der Mondblindheit. *Tierärztl. Rdsch.* 44, pp. 748-753 and 761-769. Abst. by V. Chládek in the *Vet. Bul.*, 9:12, p. 872.

[18] Snyder, F. F., 1938. Factors concerned in the duration of pregnancy. *Physiol. Rev.* 18, pp. 578-596. Abst. by J. M. Robson in the *Vet. Bul.*, p. 902.

abortive menstrual cycles in the monkey and the human subject.

Differences in the gestation periods of different breeds of rabbits are dependent upon hereditary factors, and the same is true for different breeds of horses. Variations in the gestation periods of a species are such that the average gestation period may approximate a multiple of the cycle, the series of pregnancies under consideration including extreme cases which range from the beginning of viability to the end of the period of post-maturity of the fetus.

* * * *

Milk Regulations in Portugal

Three designations of milk are recognized in Portugal: (1) ordinary milk, *i.e.*, milk produced from healthy cows and satisfying certain conditions relating to fat content, absence of coloring matter and pathogenic organisms, etc.; (2) pasteurized milk, *i.e.*, milk which after pasteurization satisfies the requirements relating to ordinary milk, and (3) special raw milk, *i.e.*, milk which besides satisfying the requirements relating to ordinary milk, is produced under certain conditions specified by law.[20] Cows intended for the production of milk in this last category must be previously approved and receive permanent veterinary attention. They must be housed away from densely populated areas, and there must be separate accommodations for milking. A cold storage room must be provided where milk may be kept at a temperature not exceeding 7° C., and the temperature during the sale and distribution of this milk must not exceed this figure. A sample of the milk produced each day is required to be kept for 24 hours. The personnel of the establishment must be healthy and be subject to regular medical attention.

All producers of milk must be licensed by the Municipal Veterinary Officer in accordance with instructions laid down by the Director General of Veterinary Services. Byres must conform with regulations regarding accommodation and structure. Cows whose milk appears constantly unfit for human consumption may not be used for milk production and, if not slaughtered, must be branded. Pasteurization centers are to be established throughout the country and at some future date the sale of unpasteurized milk, except the special raw milk, will be forbidden.

[20] ————, 1938. Loi sur la production du lait alimentaire. *Bol. Pec., Lisboa* 6, pp. 67-83. Abst. by H. V. Hughes in the *Vet. Bul.*, 9:12, p. 887.

* * * *

Anthrax in Mink

Deaths from anthrax among mink bred for the fur are not infrequent since the animals are commonly fed on raw beef from rendering plants. Details are given [17] of six outbreaks in England in 1938 in which 320 mink out of a total of 1,290 were proved or presumed to have died of anthrax. In one small outbreak the onset of clinical anthrax in females with latent infection was occasioned by skin abrasions during mating. There is possible danger of human infection from scratches and bites by these animals. It is concluded that the pickling of skins (in tanning as usually practiced) is a sufficient safeguard to human beings wearing mink fur.

* * * *

Deaths Caused by Domestic Animals in Germany

Official records for the period 1926-1934 show that the annual number of accidents to human beings caused by domestic animals fluctuated between 298 and 417.[19] By far the largest number of these fatalities were caused by horses and cattle (65.9% and 29.8% respectively), other domestic animals being responsible for only 3.5% of the total. A remarkable feature was the very small number of veterinarians involved; during the whole period under review only three received fatal injury, and of the 975 practitioners who answered a questionnaire only 186 reported having suffered from more or less serious occupational accidents.

[17] Greener, Averil W., 1939. Anthrax in milk (*Mustela vison*). *J. Hyg., Camb.* 39, pp. 149-153. Abst. in the *Vet. Bul.*, 9:12, p. 815, by F. C. Minett.

[19] Habernoll, A., 1938. Die Haustiere als Ursache von Unfällen in Deutschland unter besonderer Berücksichtigung der Berufsverletzungen der Tierärzte Preussens. *Berl. Munch. Tierarztl. Wschr.* July 1, 393-395, and July 8, 407-410. Abst. in the *Vet. Bul.*, 9:12, p. 904.

Book Reviews

Osteology, Arthrology and Myology of the Horse. *By R. L. Mundhenk,* P.D., D.V.M., Professor of Anatomy and Histology, Alabama Polytechnic Institute. Spiral binding. 97 pages. Planographed by Edwards Brothers, Inc., Ann Arbor, Mich., 1939.

This excellent student's dissection guide, like the companion volume "Angiology and Splanchnology of the Horse" (see below), is printed on the planograph and on only one side of the pages, the obverse being for notes and drawings by the student.

An innovation is an introduction stressing the importance to the student and practitioner of veterinary medicine of correct pronunciation, correct spelling, and correct use of the technical words of his profession. Some discussion is given of the formation of the plural and genitive of Latin nouns of the different declensions. The first exercise prescribed for the student in each section is to learn the spelling, pronunciation, and definition of the technical terms used in it, a list of which is given.

* * * *

Angiology and Splanchnology of the Horse. *By R. L. Mundhenk,* P.D., D.V.M., Professor of Anatomy and Histology, Alabama Polytechnic Institute. Spiral binding. 98 pages. Planographed by Edwards Brothers, Inc., Ann Arbor, Mich., 1939.

* * * *

Horses and Americans. *By Phil Stong.* Cloth bound. 333 pages; 103 illustrations, from old prints and photographs. Frederick A. Stokes Co., New York, 1939. $5.00.

The author, who originated in the great "hoss" region of Iowa, where local color for his book-club novel "State Fair" was acquired, was selected to write this book, which tells the story of the part the horse has played in the history and development of this country. The historical epic begins with the armored horses of Cortez and Coronado, and the first chapter is given to speculation as to the origin of the "plains pony."

The preparation of such a work requires an author to be iconoclastic in separating the fable in horse lore from the fact. Mr. Stong is facetious in his resumé of the foundation stock of the 20 common breeds that now exist and their recorded progeny. He blasts confidence in whatever greatness has been bestowed upon the "great" progenitors by horse historians who possess an aptitude for exaggeration and inaccuracy. However, something—perhaps too hurried research; 12 pages are devoted to the bibliography—has caused him to join the ranks of other writers on the life story of the American horse in becoming afflicted with the same germ of inaccuracy which he complains about. It was astounding to discover that he has taken the liberty of mounting the men of Pickett's Division, so that the startled reader learns that the famous charge at Gettysburg was made by cavalry!

The repetition of almost identical passages in different chapters shows that the author wrote in haste, and he occasionally wanders from his subject. Also, it is somewhat annoying that he persists throughout the book in referring to the country "veterinary" or "veterinaries." In this and in some other respects, the terminology could have been improved if the manuscript had been submitted to a veterinarian. However, these minor flaws do not seriously impair the readability nor detract from the enjoyment of the book, which on the whole makes fascinating reading.

His criticism of veterinary quackery in the early days, prior to the Civil War, is justified, as it was not until 1863 that veterinary medicine became organized, with the distinction of having a veterinary medical association to regulate and supervise its progress. (It was 21 years later—1884—that a Federal veterinary service was established.)

Several of the author's statements, for example: "The country has an agricultural surplus. Tractors will not eat it, but horses will," and "Horses furnish their own replacements. Tractors never foal," indicate that he has a strong horse philosophy to wield against tractor propaganda in the warfare of farm economics.—*H. J. Mostyn.*